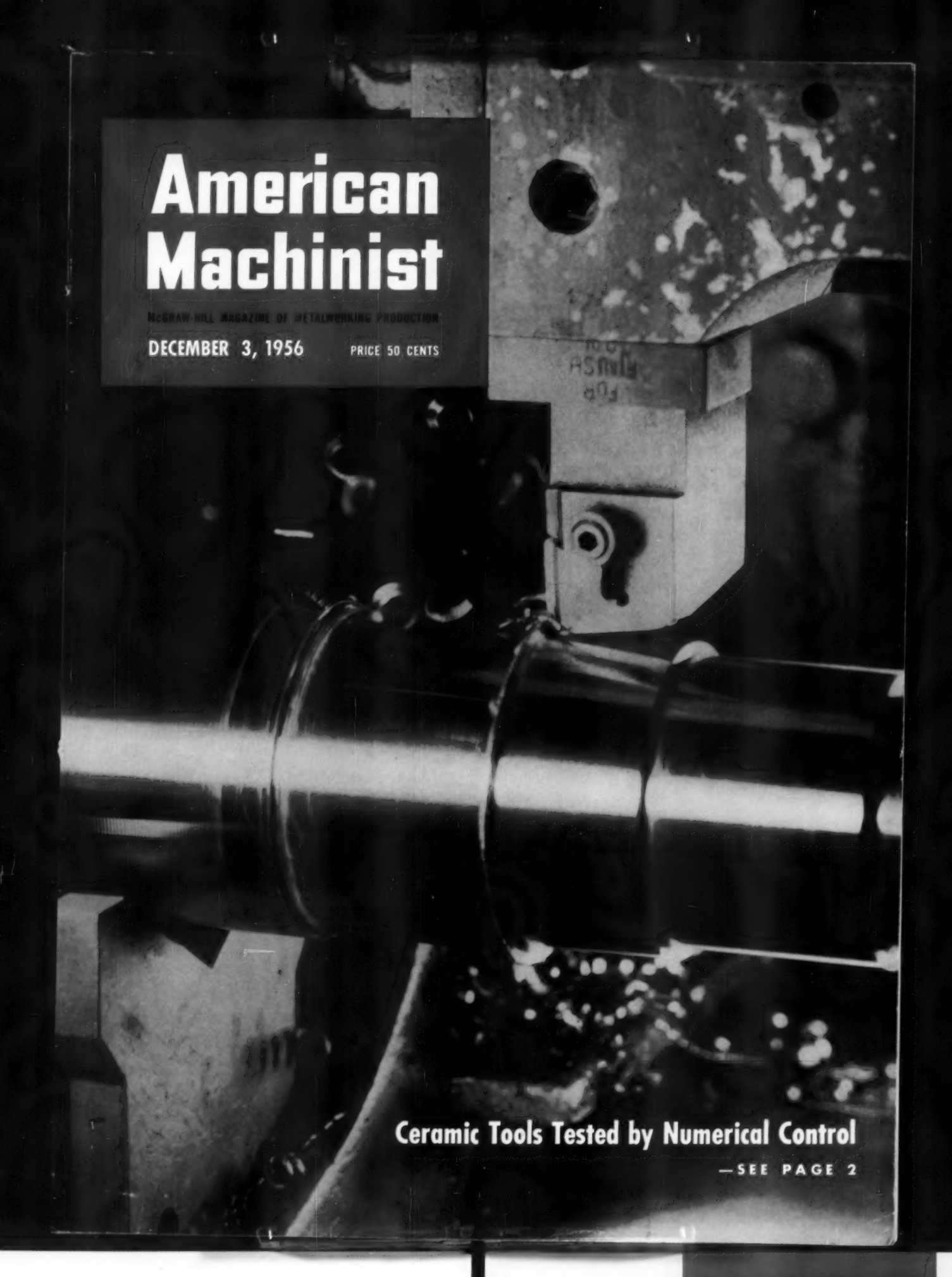


American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

DECEMBER 3, 1956 PRICE 50 CENTS

Ceramic Tools Tested by Numerical Control

—SEE PAGE 2

Heald RED HEAD'S extra precision and low maintenance

NOW AVAILABLE TO ALL USERS

of boring and internal grinding equipment

HEALD Red Head Boringheads and Wheelheads have achieved an enviable reputation for extreme precision and exceptionally low maintenance, on Heald Bore-Matics and Internal Grinders in use throughout the entire metalworking industry. Heretofore, they have been available only as original equipment or replacement items for specific Heald machines.

Now, however, in response to a continual and ever-increasing demand — and in line with the Heald policy of building standard machines and parts — it has been decided to market all standard Red Head Boringheads and Wheelheads without restriction wherever practical. This means that the extra precision and low maintenance provided by Heald Red Heads are now available to all users or manufacturers of metalworking equipment, regardless, in most cases, of the type of machines on which they will be used.

The standard head types and sizes that can be supplied are fully described and listed in the Bulletins noted below.

RED HEAD
HEALD

HEALD PERMANENTLY-LUBRICATED BORINGHEADS

Designed to provide high, sustained precision with virtually no maintenance, Heald Red Head Boringheads are permanently lubricated —no grease or oil is ever needed. They run cooler, reduce heat distortion and maintain high accuracy at all speeds and loads. Spindles run in precision bearings, specially manufactured to Heald specification and individually tested and selected for each head. Write for Bulletin 5-1, Issue 6.

HEALD HI-FREQUENCY WHEELHEADS

Providing proper speed for small-bore grinding, Heald Hi-Frequency Wheelheads deliver full power direct to wheel and eliminate drive upkeep costs. They can withstand momentary peaks of twice the continuous-duty rating. Those running over 30,000 rpm must be automatically lubricated by the Heald Oil-Mist system which also supplements effects of water cooling—others are permanently grease lubricated. Write for Bulletin 6-2, Issue 2.

HEALD PERMANENTLY-LUBRICATED WHEELHEADS

Heald Red Head Wheelheads incorporate the same high quality bearings and permanent, sealed-in lubrication as Heald Red Head Boringheads. They have repeatedly set the highest standards of accuracy, precision and surface finish. There are three general types: Quill Style, for a variety of work — Naked Style for high production on a single workpiece — Sleeve Style for large bores. Write for Bulletin 6-1, Issue 7.

IT PAYS TO COME TO HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

NEWS REPORT ..

. . . Spot News . . 97
. . . Washington . . 99
. . . Detroit . . 101
. . . Machine Tools . . 103
. . . What's Ahead . . 107
. . . General News . . 170
. . . Names . . 178

Departments...

Letters . . 90
Editorial . . 111
Practical Ideas . . 156
Round Table . . 155
. . . Discussion . . 226
Talking Shop . . 169
New Equipment . . 180
New Bulletins . . 184c

contents for December 3, 1956

VOLUME 100, NUMBER 26

Report on Russia, Part 2: Russia's sixth Five-Year Plan . . . Can the Soviet Union overtake the U S in industrial production by 1960? Second in our series of exclusive, eyewitness reports from Moscow. **137**

Conventional machines work world's largest airframe forging . . . With no "elephant" machine available, real ingenuity is required. *By Edward H Parks, The Martin Co.* **141**

How to measure large dimensions . . . Long gage bars can be combined up to 50-ft length to avoid special single-purpose gages. *By Dr Hans W Schmidt.* **145**

This spacing gage is light and quick to build . . . plastic tooling saves weight, has accuracy comparable to that of steel. *By James H Tanner, A O Smith Corp.* **148**

Steam "tithes" machine-cleaning time . . . Modern cleaning methods can save on maintenance labor. **150**

Small shops can calculate costs . . . A simple system that can be refined or tailored to fit as needed. *By Joseph Mencotti, Oval Tool & Die Corp.* . . . **152**

The answer to non-linear threads . . . A lathe attachment developed by the National Bureau of Standards. **154**

SPECIAL REPORT NUMBER 435

How good are ceramic tools? . . . Reports from seven sources provide new and compelling evidence of the place oxide tools will have in your operations. **113**

1. Ceramic tools speed gear production at Ford. **114**
2. Production turning with ceramic tools at Scully-Jones. **117**
3. Why oxide tools can cut faster. (Armour Research Foundation). **121**
4. What we have learned about ceramics at Warner & Swasey. **123**
5. Lathe tests compare carbides and ceramics at International Harvester. **125**
6. Punched cards control lathes to test ceramics at Sundstrand. **128**
7. Ceramic tools are evaluated at Monarch. **132**

REFERENCE BOOK SHEETS

Layout of involute templets I, II, III . . . The problem is simplified by reducing all computations to right-triangle solutions. *By James W Duffy* . . . **163**

American Machinist *Chips*

Cover . . .
A ceramic tool cuts SAE 4140 at 1200 sfpm on a Sundstrand Model 14 automatic lathe with punched-card control. Article on page 128.

Ceramic tools are certainly the development in Metalworking that has attracted the most attention during the past year. The basic question about them of greatest interest is "How good are they?" In this issue we bring you, in a Special Report, seven articles that, taken together, begin to provide an answer.

A high-production application at Ford, believed to be the first, leads the report and there are results of production experience from Scully-Jones and Warner & Swasey. There are also detailed reports of tests at International Harvester, Monarch, and Sundstrand. Together with some evaluation from Armour Research, these articles provide the most detailed reporting of how good ceramic tools are that has been published. It is a fitting follow-up to the report we published last March (*AM*—Mar 12 '56, p153) that summarized the then available data on the new tool materials.

Checking on ceramic developments has been a regular thing with our editors for more than two years, starting with the article on what Russia was doing (*AM*—Nov 22 '54, p113), following up with the first published details of the research at Watertown Arsenal (*AM*—Feb 28 '55, p153), then many others including the well-known Special Report mentioned above.

This present report was born over a dinner table in Cleveland a few weeks ago. Several of us have been following the work various companies are doing. Between the soup and the shortcake at this dinner, Andy Ashburn, Ben Brosheer, and George De Groat decided the time was ripe to break some real data loose. They felt that, with luck, they might get three or four companies to release results and set this issue as their deadline. As you can see, they set their goal a little low. They ended up with seven sources and a collection of reports you will find of real value if you, too, want to know: "How good are ceramic tools?" See page 113.

Coming . . . *AM* for Dec 17 will feature an article analyzing the reasons behind decisions made at General Electric in planning the famous motor plant in Building 85. The Special Report will tell how to use logic functions in machine-tool control. There will be a group of articles on the testing of honeycomb. Among the other features you will find some valuable tips on the training of machine operators, an unusually clear analysis of the ways to reduce the cost of machining without replacing the machine, and some ideas on forming and assembling aluminum frames. It adds up to an issue so full of good new ideas that your Christmas shopping will just have to wait.

Joseph Mencotti, . . . who contributes the article on how small shops can calculate costs (page 152), obtained his higher education by night school and correspondence course. He has had eight years of banking experience and 15 years in internal auditing, half of them as a traveling auditor for General Motors. He managed the GM Branch Audit Staff from 1945 to 1951. In addition to his post as secretary of Oval Tool & Die Corp, he is a consultant to five Detroit firms, and a director of four Michigan corporations.

ALBERT HAUPTLI publisher

BURNHAM FINNEY editor
E J TANGERMAN executive editor

ANDERSON ASHBURN managing editor
RUPERT LE GRAND senior associate editor

BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
WM M STOCKER, JR associate editor
JOHN P WRIGHT associate editor
GEORGE H DE GROAT (Detroit) associate editor

ANN McTAGUE assistant editor
TOM JOHNSON assistant editor
GOSTA WERNBERG assistant editor

RICHARD E ROOMAN art director
ANNE PALMER assistant
MATTHEW T HAGGERTY makeup

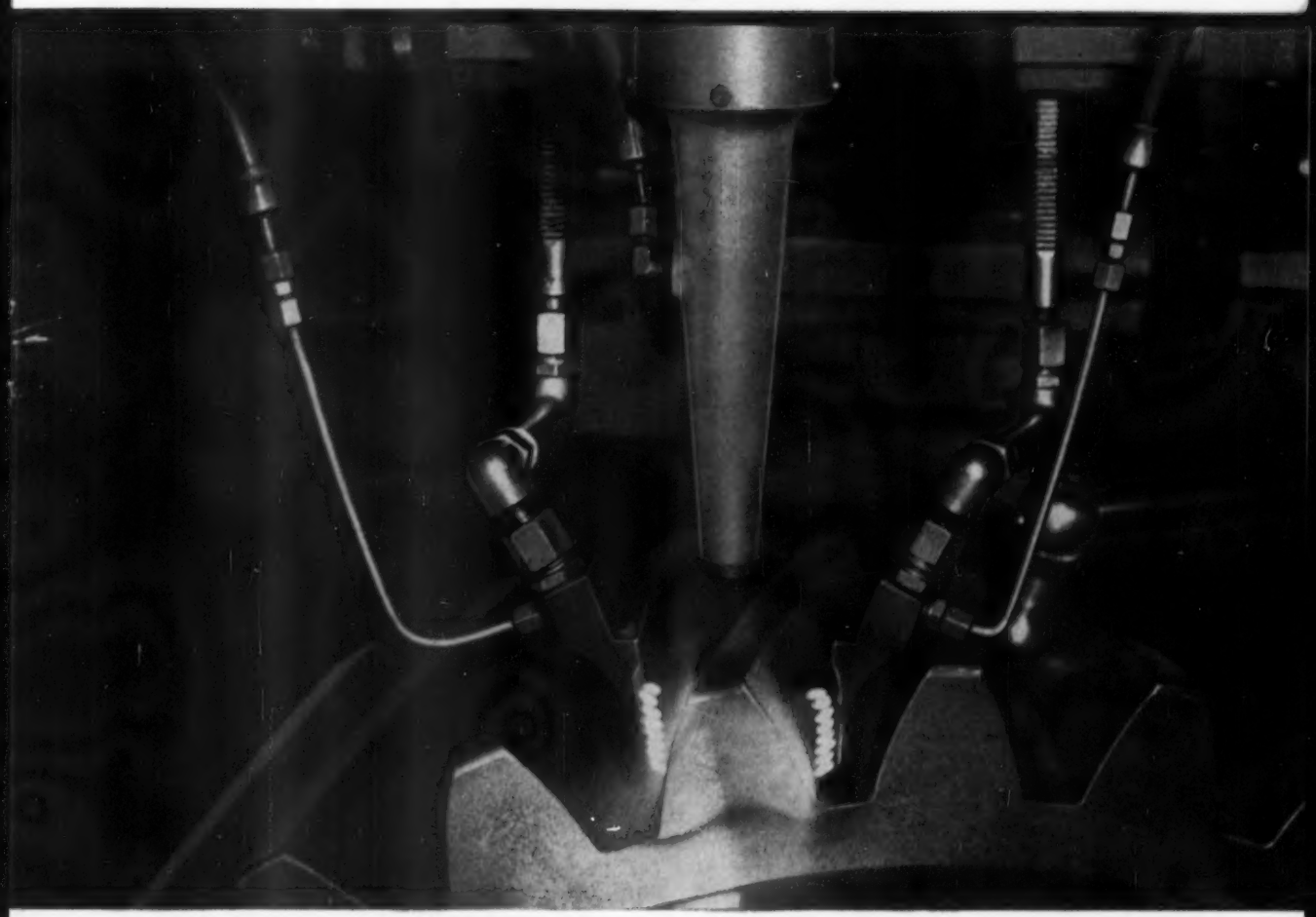
ROBERT SHEETS news editor
HARRY HOMEWOOD Detroit
ROBERT E COCHRAN Cleveland
MARGARET RALSTON San Francisco
JOHN SHINN Los Angeles
HAROLD HOOD Los Angeles
A R HENRY Atlanta
WILLIAM J COUGHLIN London
ROBERT E FARRELL Paris
PETER WEAVER Rio de Janeiro
GERALD W SCHRODER Bonn
DAN KURZMAN Tokyo
JOHN H KEARNEY Mexico City
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept
GEORGE B BRYANT, JR chief Washington bureau
JOHN WILHELM editor world news
FRED H COLVIN editor emeritus

GEORGE REPPERT, JR advertising sales manager
RUSSELL T DOUGLAS business manager
CATHERINE C KANE manager, reader service

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

American Machinist, published bi-weekly, with an additional issue in mid-November, by McGraw-Hill Publishing Company, Inc, James H McGraw (1860-1948), Founder.
EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, NY. Donald C McGraw President; Paul Montgomery, Executive Vice President; Joseph A Gerardi, Vice President and Treasurer; John J Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Joseph H Allen, Vice President, Director of Advertising Sales; J E Blackburn, Jr, Vice President and Circulation Director.
SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 36, NY. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.
Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Other Western Hemisphere and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Second-class mail privileges authorized at New York, NY.
Copyright 1956 by McGraw-Hill Publishing Co, Inc—All Rights Reserved.



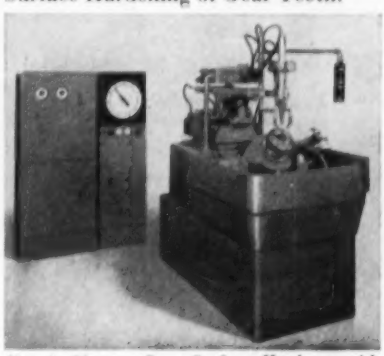
It uniformly controls
surface hardening of gear teeth

You can step up the wear resistance of gear teeth greatly with Gleason Surface Hardeners. They provide localized hardening *without distortion* because of uniform temperature control.

Key to this performance is the radiation pyrometer and electronic controls. That vertical gun-like barrel in the center of the photo above is the radiation pyrometer. It is focusing directly on the tooth being hardened. As the oxyacetylene burners heat the tooth, the thermopile receives radiant energy from the heated metal. An electronic balancing device converts that energy to control forces which govern the travel of the burners along the tooth.

This makes surface hardening of gear teeth an exact operation. There is no measurable distortion because only the gear teeth are heated and each tooth is heated uniformly on both sides. The region of hardness is limited to the wearing surfaces, thus greatly increasing gear life.

Gleason Surface Hardeners assure absolute uniformity of all teeth on a gear and every gear in a lot. They are adaptable to hardening straight bevel, spiral bevel, Zerol, spur, herringbone and helical gears. For additional information, write for the booklet "The Surface Hardening of Gear Teeth."



No. 1 Gleason Gear Surface Hardener with electronic control unit. Accommodates bevel gears up to 24" pitch diameter, spur and helical gears up to 30", internal gears up to 24" outside diameter.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

7 Operations
. . . by CINCINNATI 4-UNIT

Today's transmission cases demand careful handling, low machining pressures, rapid production. These and other requirements are built into the CINCINNATI® 4-Unit Automatic Transfer Type Milling and Drilling Machine illustrated here. Seven machining operations and their related handling chores are performed automatically at the rate of 127 per hour, as the part progresses from right to left.

Unit 1 — Three operations: 1) rough, 2) semi-finish, 3) finish mill joint face

Unit 2 — Two operations: 1) drill, and 2) ream two manufacturing holes

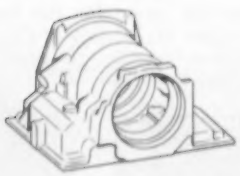
Unit 3 — One operation: rough mill ends

Unit 4 — One operation: finish mill ends

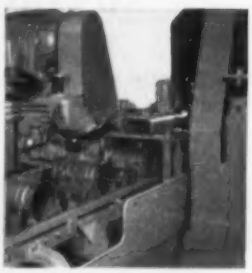
Cincinnati engineered and built equipment of this type, and hundreds of other sizes, are busily at work in metal-working shops throughout the world. These cost-reducing machines are developments of Cincinnati Special Machine Tool Division. May we show you what this Division can do to reduce your costs? Give us complete details; a Cincinnati specialist will go to work on the job.

Special Machine Tool Division

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



ENDS: a finish milling operation, following multiple drilling, gives the ends of the part a high-quality surface.



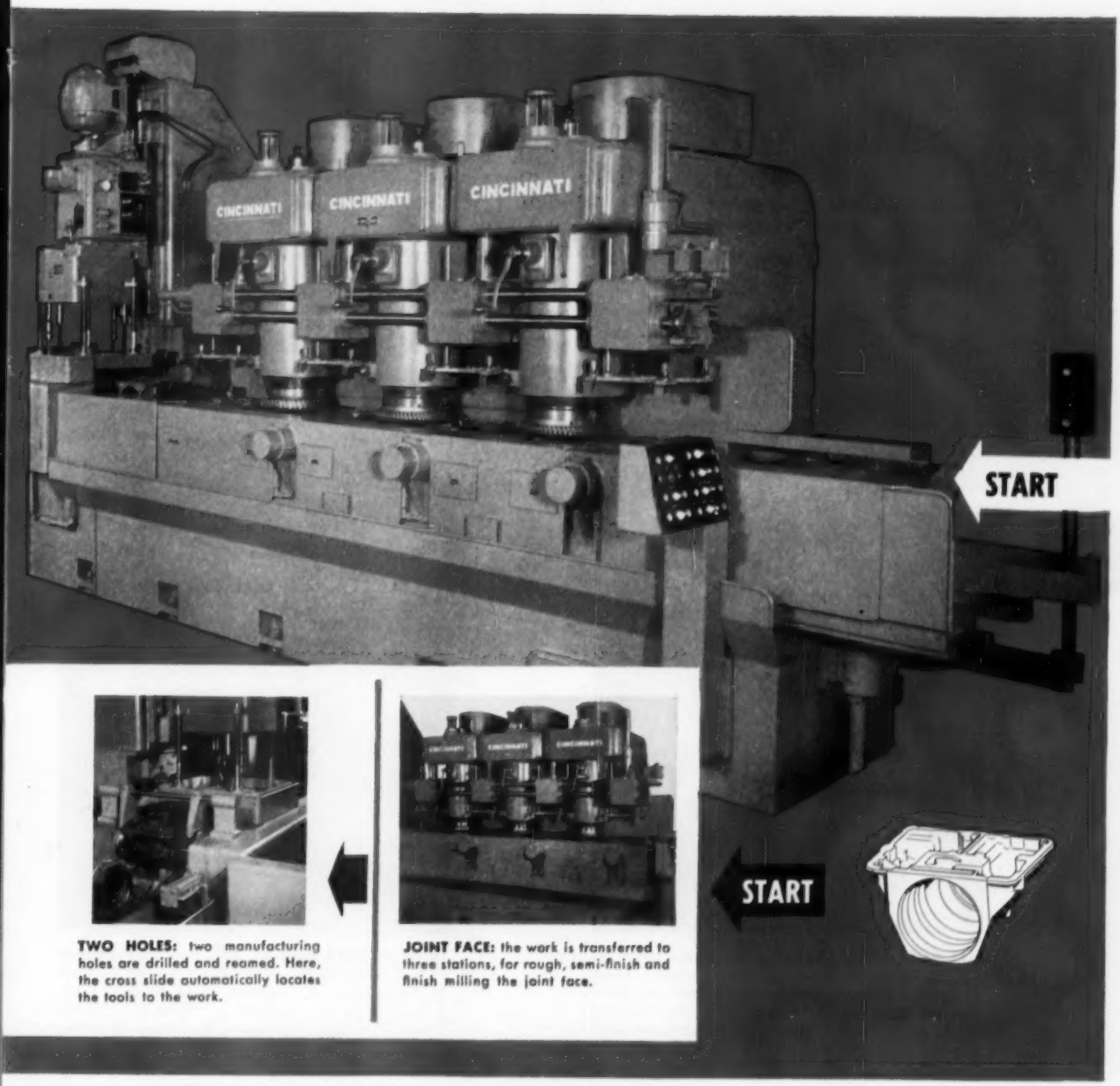
ENDS: before reaching this unit, the work has been turned over and located for a rough milling operation on the ends.

CINCINNATI

CINCINNATI

performed automatically

TRANSFER TYPE MACHINE

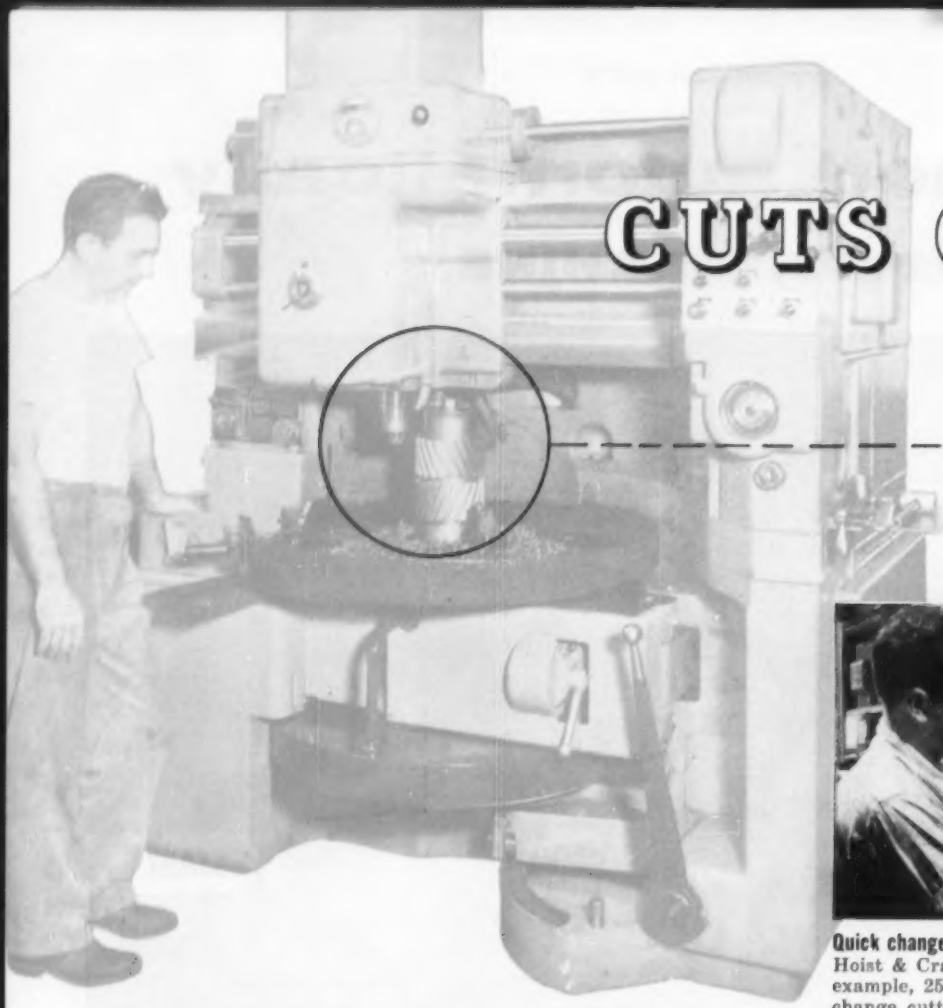


TWO HOLES: two manufacturing holes are drilled and reamed. Here, the cross slide automatically locates the tools to the work.

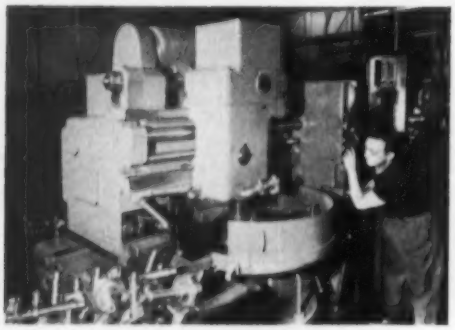
JOINT FACE: the work is transferred to three stations, for rough, semi-finish and finish milling the joint face.

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES
HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

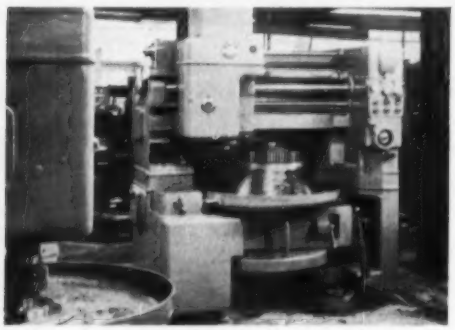
CUTS COSTS



Quick change cuts costs on short runs: at Silent Hoist & Crane Company, Brooklyn, N. Y., for example, 25 seconds is all the time needed to change cutter speed, depth of cut and rotary feed for different sized sprockets.



Five times faster than the machines they replaced on a variety of jobs, 36-Type Gear Shapers set many cost-cutting records at New Process Gear Co., Syracuse, N. Y. Part shown cut in one operation. Rate: 135 finished per day.

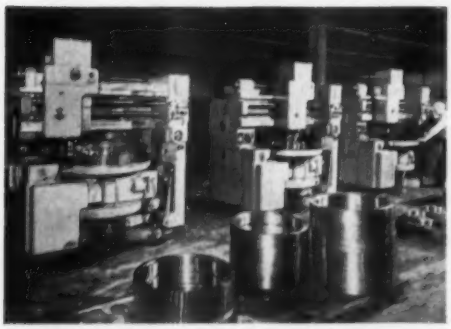


Faster on gears up to 36″ P.D., two 36-Type machines replaced *five* older machines at Samuel M. Langston Co., Camden, N. J. 22.250″ P.D., 4 D.P. steel spur shown is cut in 2⅛ hours. Production time on previous machine—10 hours.

THE PRECISION LINE

5 WAYS

FELLOWS 36-TYPE GEAR SHAPER



Heavy cutting power: 36-Type Gear Shaper removes 93 cubic inches of stock (26 lbs.) from the blank in just two cuts to make this 25.3" P.D., 3 D.P. gear at Fairfield Manufacturing Co., Lafayette, Ind. Total time: 258 minutes.

More efficient small gear cutting, too: 57 minutes is all it takes to cut each hand of this 6.486" P.D., 5/7 D.P.; 23° H.A., herringbone pinion at Snow-Nabstedt Corporation, Hamden, Conn., on their 36-Type Gear Shapers.

Here's the way to lower gear production costs even though over-all costs keep rising! These major firms (and many others) have proved that fast, accurate Fellows 36-Type Gear Shapers have the power, speed and versatility to cut production costs . . . often by more than 50%!

Set-ups are fast and simple for a wide range of jobs up to 36" P.D. Cutter speeds from 18 to 300 strokes per minute are available through a selector dial. Four rotary feeds are available through a feed lever, additional feeds through two pick-off gears. Semi-automatic fixtures may be used to decrease loading time.

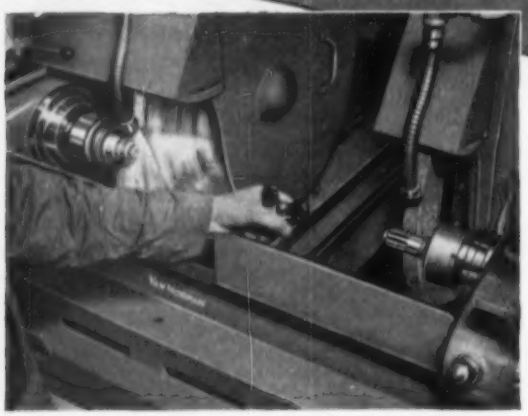
Whether for long runs or many varied jobs, the powerful, versatile Fellows 36-Type Gear Shaper can very probably lower *your* gear production costs. Your Fellows Representative can give you valuable facts and figures about the benefits of investing in the Fellows Precision Line of gear production equipment. Write, wire, or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 N. Woodward Ave., Royal Oak, Mich.
150 West Pleasant Avenue, Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

Fellows *Gear Production Equipment*

VAN NORMAN

Van Norman "Bowgage" 4BG2 double head plunge cut chucking grinder. Capacity: 6" swing double work head. Grinding wheel: 30" x (¾ to 6) x (12 or 20). Grinding wheel motor: 10 to 20 H.P.



Grinding Universal joint flange on the Van Norman "Bowgage" 4BG2 — .022 stock removal — 1.625 diam. — 15 R.M.S. — Maximum 480 pieces per hour.

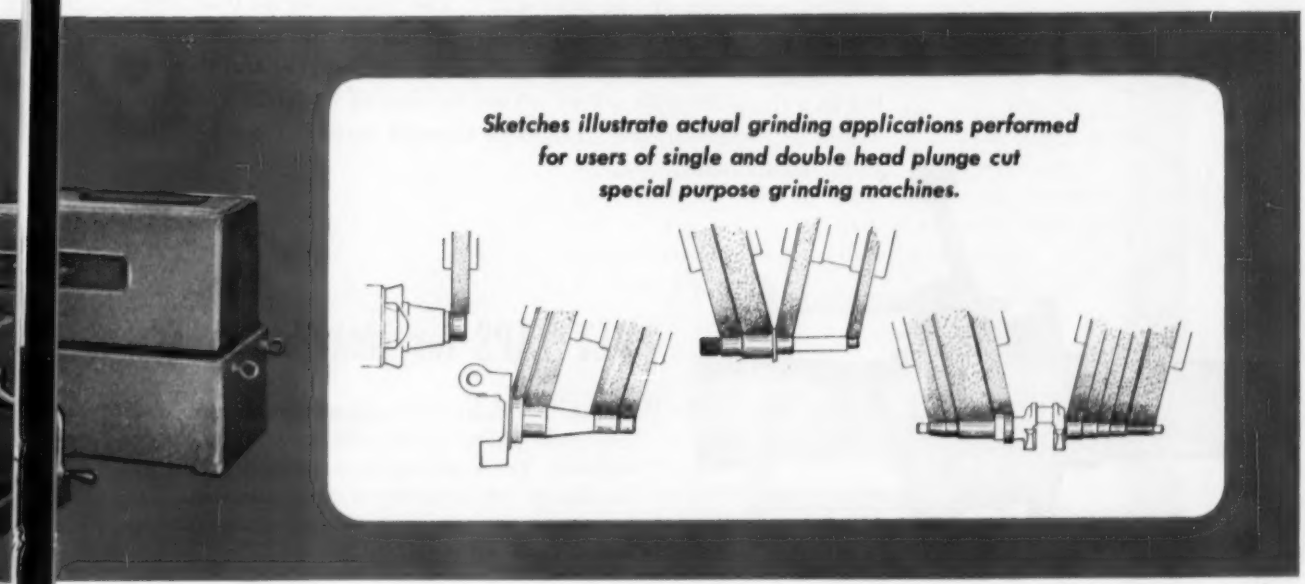
VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

"BOWGAGE" PRODUCTION GRINDERS

"Engineered for the Job"

Outperform Them All For Speed, Accuracy and Low Cost Grinding



Sketches illustrate actual grinding applications performed for users of single and double head plunge cut special purpose grinding machines.

You just can't beat Van Norman "Bowgage" Production Grinders for fast, economical mass production. These massive, rugged grinders are "*engineered for the job*" to meet your exacting requirements.

Illustrated is the Van Norman "Bowgage" 4BG2 double head plunge cut grinder designed and built for a major automotive manufacturer. Day after day, this 14.8 ton rugged brute and other single and double head grinders are showing substantial savings by keeping production up and costs down.

If you have a mass production grinding problem, let Van Norman Engineers help you solve it. Write for their help, today.

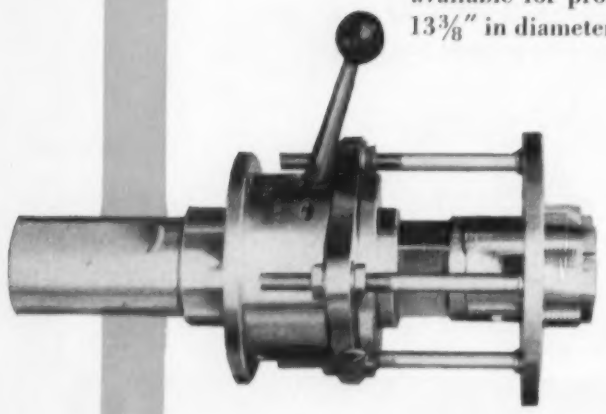
**Don't wait . . . for extra profits install a Van Norman Machine now! They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . See your dealer or write Van Norman Company. Conditional Sales Contracts not available to Export.*

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

LANDIS Collapsible Taps

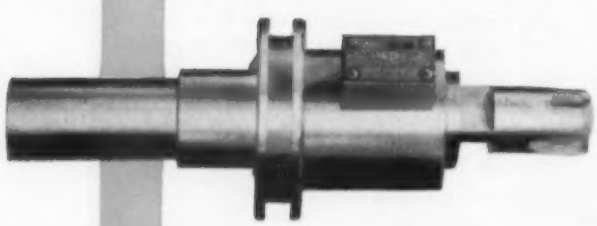
Sensitive Collapsing Action

The design of LANDIS Collapsible Taps reduces tool wear, "torn" threads and tapping time by permitting direct removal from the workpiece without reversing or "backing out". The sensitivity of this "collapsing action", which automatically withdraws the chasers from the completed thread, assures uniform thread lengths and threading to a shoulder with safety. Various sizes of LANDIS Taps are available for producing straight or tapered threads from $1\frac{1}{4}$" to $13\frac{3}{8}$" in diameter.



ALT TAPS for straight threads

These taps feature a rugged construction and design simplicity which enable maximum chaser rigidity. The same tap may be used for either stationary (shown) or rotary application. Tapered threads can be tapped using chasers cutting across their entire width.

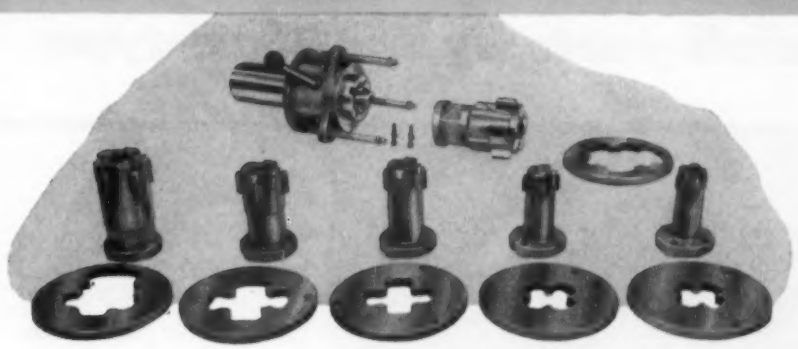


LL TAPS for tapered threads

The thread taper is produced by mechanical receding action of the chasers during threading. This action reduces cutting strains by restricting cutting action to the chaser throat or chamfer section. As little or no "cold working" can result, LL Taps are ideally suited for tapping tapered threads in stainless steel. These taps will also produce straight threads, and are available for either stationary or rotary applications.

Sensitive Collapsing Action

Straight or Tapered Threads Rotary or Stationary Use

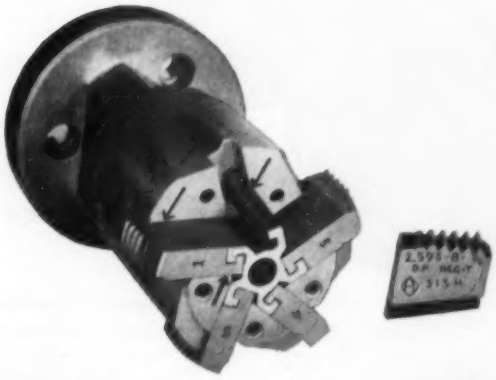


Wide Range Coverage

Detachable heads are a feature of all LANDIS Collapsible taps. This design allows tapping a wide range of thread diameters with minimum tooling—for example, the 3ALT body using 6 different heads will tap all diameters from 1¼" to 3¼". Each tap head itself has a wide threading range—the 1½" head will thread from 1⅜" to 1⅝", the 2" from 1⅞" to 2-5/16", the 3" from 2¾" to 3¼".

Maximum Rigidity

The basic design of all LANDIS Tap Heads assures maximum bearing support between the chaser, plunger and tap head body. In the cross-section illustration, note the heavy metal sections which provide rigidity to the chasers and plunger, particularly at the points where cutting strains are transmitted.



Size Adjustment Ease

All LANDIS Taps are designed so that they may be quickly adjusted approximately 1/32" over or under the nominal chaser size. The ratchet-type size-adjusting screw is conveniently located in the front of the tap. The movement of one ratchet tooth provides a self-locking diametrical adjustment of .001".

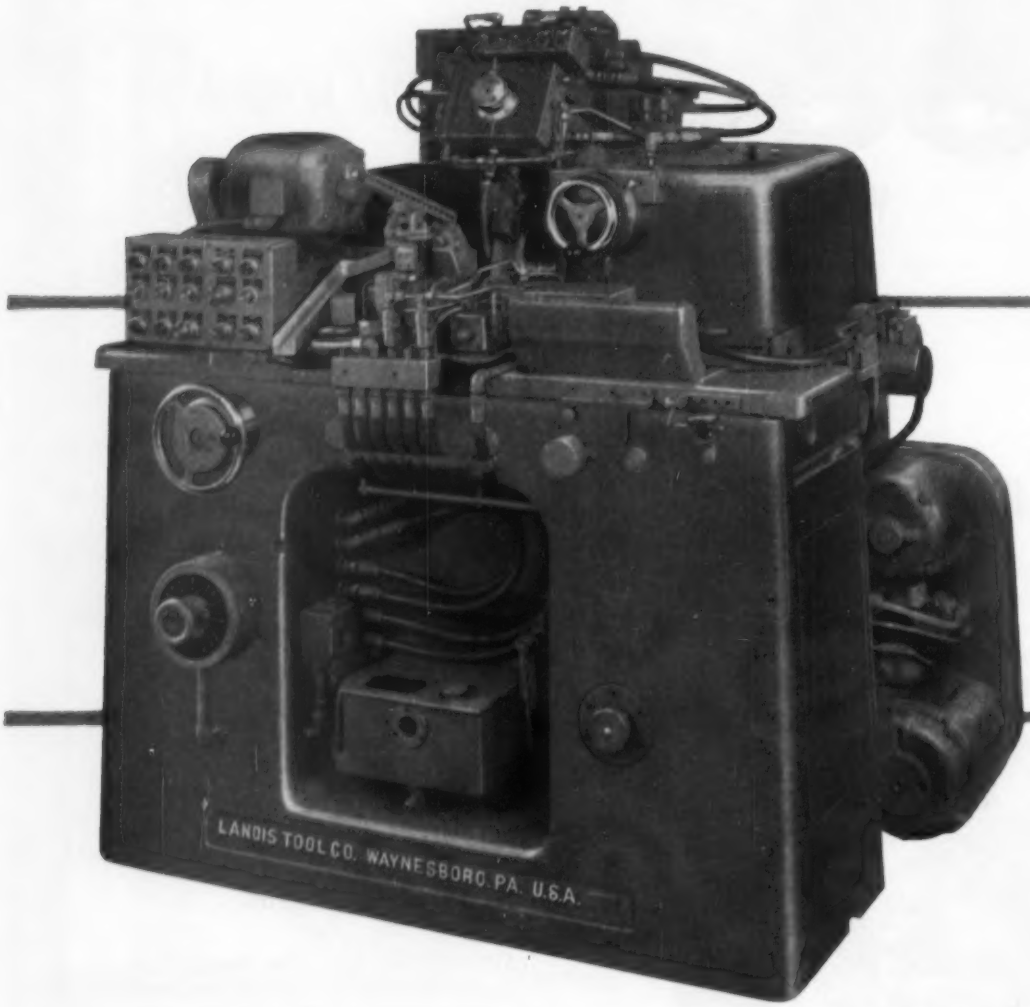
LANDIS Machine COMPANY
WAYNESBORO • PENNSYLVANIA • U. S. A.

430-C THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT • CUTTING • TAPPING • GRINDING • ROLLING

Straight or Tapered Threads Rotary or Stationary Use

Change automatic grinder

...grinding small parts by the shoe-type



Landis 4" Automatic Concentric Grinder
arranged for grinding grooves in inner races

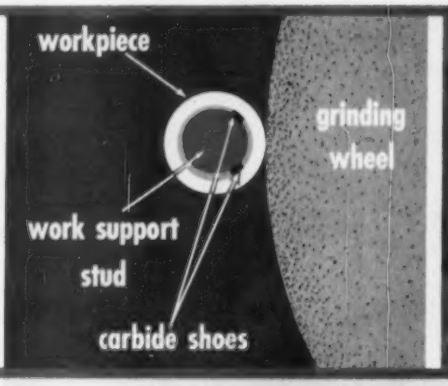
LANDIS

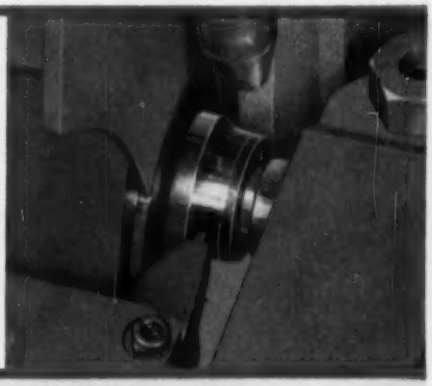
precision grinders

setup in less than one hour!

centerless method on Landis 4" concentric

shoes locate on I.D.
work loaded automatically



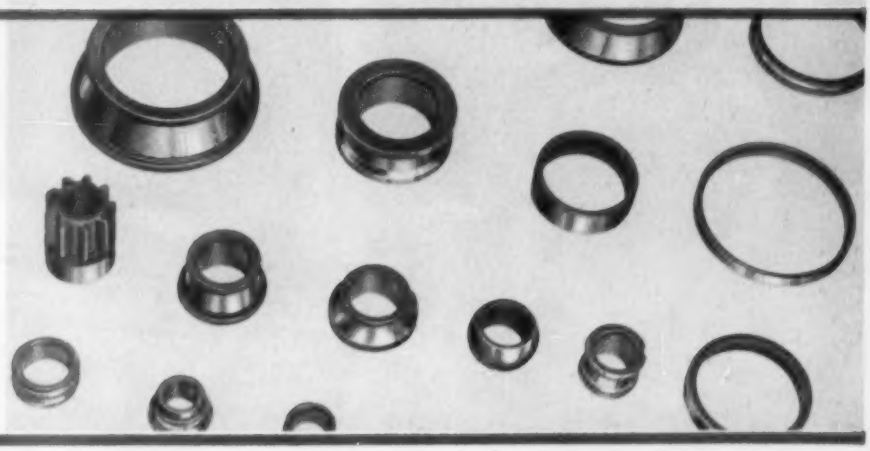


change setup in
less than one hour

actual time recorded during a typical major setup change

1	Remove guard, magazine, guide cover and plate		31 Sec.
2	Remove work arbor and chuck	2 Min.	10 Sec.
3	Install new driving chuck (or driver)	2 Min.	15 Sec.
4	Install work setting gauge, adjust and remove	4 Min.	30 Sec.
5	Install guard, magazine, guide cover and plate	3 Min.	10 Sec.
6	Install lapping wheel, lap chuck and remove	15 Min.	
7	Locate carriage	3 Min.	
8	Set diamond for correct radius and dress	6 Min.	
9	Adjust cycle and headstock speed	4 Min.	
	TOTAL TIME ELAPSED	**40 Min.**	**36 Sec.**

parts like these ground
to super precision



LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

Giddings & Lewis

MODEL

350-T

precision horizontal boring, drilling and milling machine

LITERATURE AVAILABLE:
For complete specifications on Models 350-T and 340-T horizontal boring, drilling and milling machines, write for Bulletin No. 30-T.

Any large or small manufacturing plant can profitably own a G&L 30 Series table-type horizontal bar. Here's a machine that enables you to perform a variety of precision work at higher productive capacity and at lower cost than any other machine on the market.

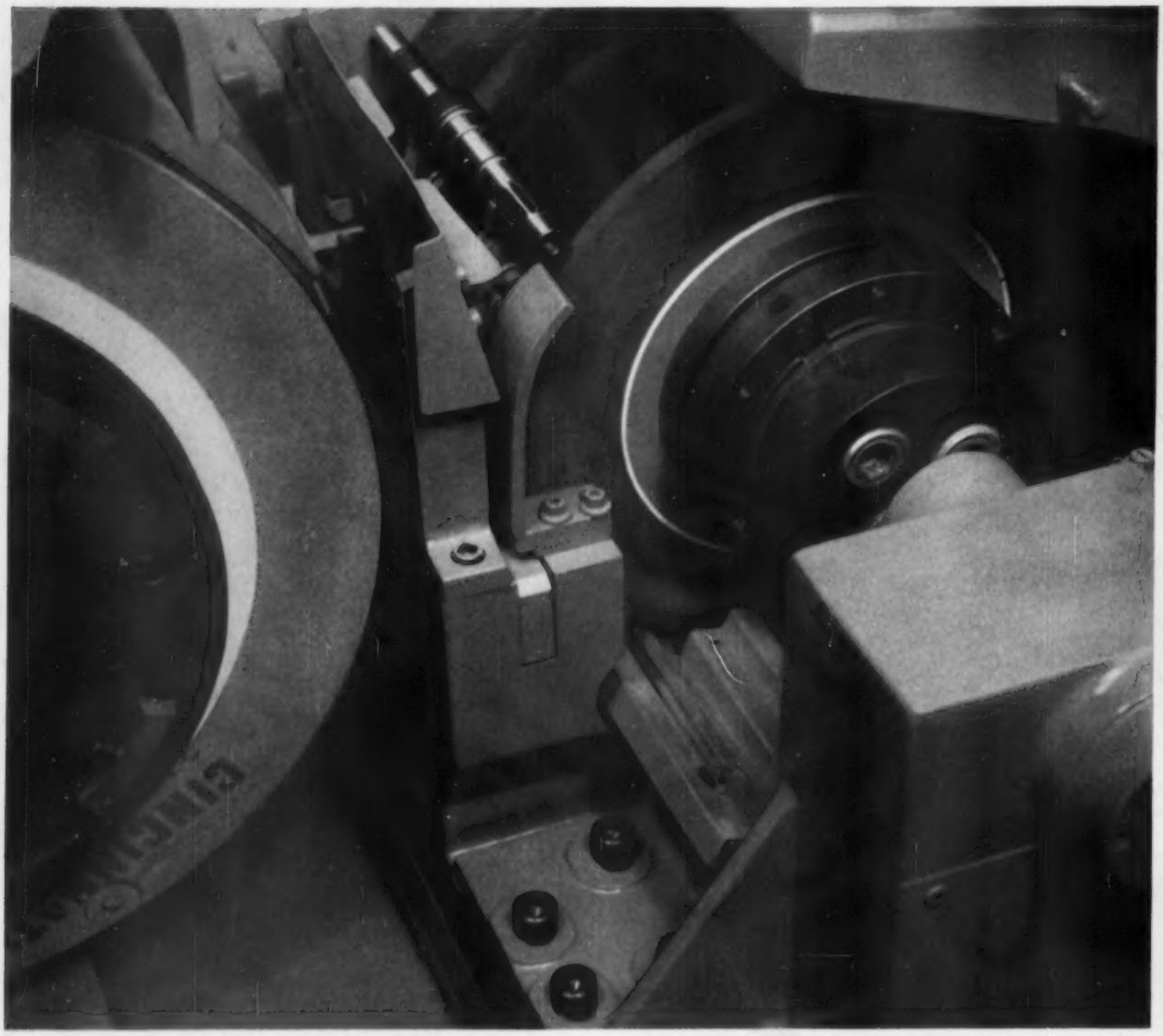
Two popular horizontals in the 30 Series line are the Model 350-T with 5" dia. spindle (25 hp) and Model 340-T with 4" dia. spindle (20 hp). Other horizontal boring machines are offered in spindle diameters ranging from 3" to 14". . . main motor drives 10-150 hp.

For more information on G&L's complete line of horizontals and their many profit-making accessories and attachments — built-in rotary tables, electric automatic positioning device, etc. — contact your nearest G&L representative or write direct.

G & L and HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-69

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

Cincinnati Filmatic



Refrigerator crankshafts are safely and economically ground at an estimated production of 100 per hour on the CINCINNATI FILMATIC No. 2 Centerless production package illustrated above. Equipment includes an Electro-Hydraulic Automatic Infeed Attachment and a mechanically operated elevating fixture of the "wrap-around" type. The work loading cradle is pivoted on the same center as the regulating wheel spindle, and as it elevates to loading position, it follows the diameter of the regulating wheel. This construction assures a maximum factor of safety in loading and removing the work. CINCINNATI FILMATIC Centerless Grinders are "naturals" for work of this type.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

Nos. 0 2 3 4 5 6 Centerless

The No. 2 is the machine for this job . . . grinding four diameters of household refrigerator crankshafts

FILMATIC

Multiple diameter jobs are "naturals" for CINCINNATI® FILMATIC Centerless Grinders . . . and for Cincinnati's 32 years' experience in centerless tooling. The illustration at the left shows how these two major elements of production—the right machine and the proper tooling—have been combined to reduce the cost of grinding four diameters on crankshafts for a well-known refrigerator. ¶ A new CINCINNATI FILMATIC No. 2 was selected for the job. All four diameters are centerless ground simultaneously; to close limits of accuracy; exactly in line with each other.

The operator merely pushes a button, and the entire grinding cycle proceeds automatically.

Much of the outstanding success of centerless grinding this part can be attributed to the machine. FILMATIC grinding wheel spindle bearings cannot deflect under wide infeed cuts; bed-rock design for grinding wheel spindle housing withstands maximum hp metal removal; swivel mounting of regulating wheel pile simplifies setups; anti-friction infeed slide reduces maintenance and helps to maintain close tolerances. Would you like to know more about the latest CINCINNATI FILMATIC No. 2 Centerless? Or perhaps the entire line? Look in Sweet's Machine Tool File.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

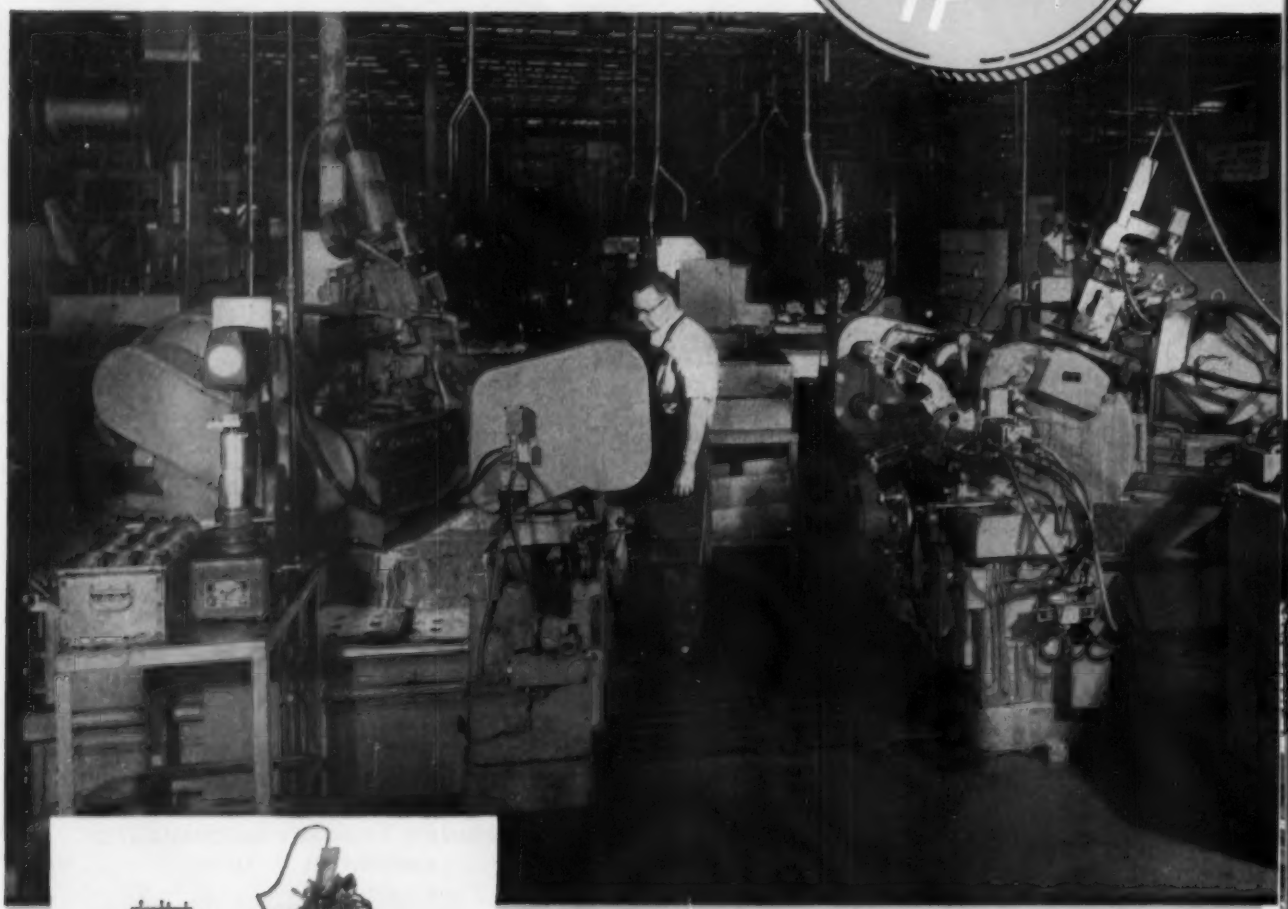
CINCINNATI FILMATIC
No. 2 CENTERLESS
GRINDING MACHINE
CATALOG No. G-644-2

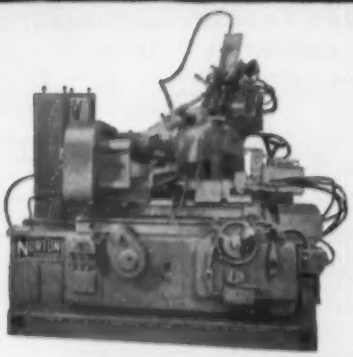
GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

First grinder to do this job — this way!

Versatile Norton Type CV-4 Machines in big transmission plant

enable new cost-cutting operation





TWO NORTON TYPE CV-4 10" Automatic Angular Wheelslide Grinders that have made possible a new, improved grinding method in the transmission plant of a prominent automotive manufacturer. (See other photo and diagram for details.) These two machines are tended by a single operator, who merely keeps the automatic loading device supplied with parts and removes ground parts from the unloading chute. Designed to grind thrust surfaces and adjacent diameters in one automatic plunge grind, Type CV-4's eliminate the usual separate operation on the shoulder or thrust surface. They are available with hand table or hydraulic power table traverse in 10" and 14" sizes, and in work lengths of 18", 30", 48" or 72".

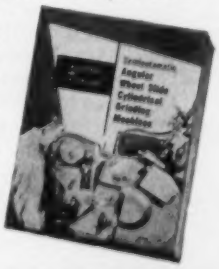
The job described here proves how easily the Norton Type CV-4 Automatic Angular Wheelslide Grinder can be adapted to meet individual needs for more efficient grinding operations.

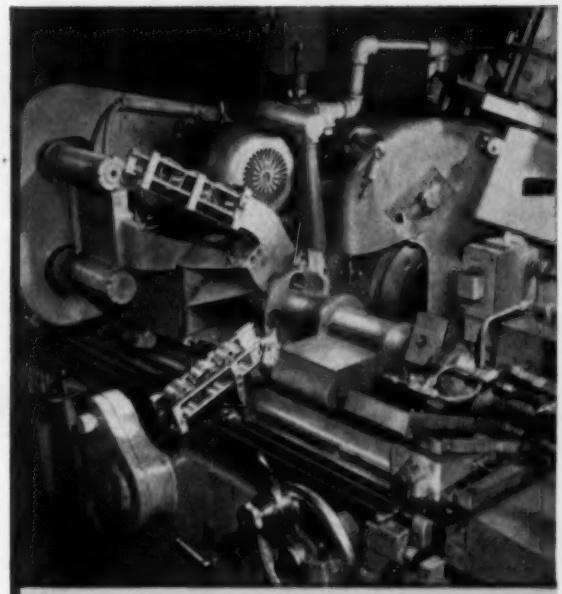
Doing several fast, precision grinding jobs at once is routine performance for this advanced cylindrical grinder. And it does them better! For example, it leaves a concentric grain pattern in the thrust surface finish, improving the seal surface and appearance. Other "Touch of Gold" advantages for rapid grinding action and top-quality production, with simplified operation and maintenance include:

- *Automatic wheel feed with "click-count" index enables settings for wheel slide movement in increments as fine as .00005". Graduated wheel feed hand wheel indicates amount of feed as it rotates. Both length and rate of automatic wheel feed easily adjusted from operation position.*
- *Automatic wheel head mounted truing device (optional) provides push-button control of straight, stepped or formed truing — eliminates need of skill and reduces wheel cost per piece ground.*
- *Ramped outlet from coolant tank speeds clean-out . . . pumps and motors all outside and easy to reach . . . electrical controls all grouped in raised enclosure . . . base ways protected by steel tape guards, requiring no additional floor space . . . hydraulic oil and ways lubricant carried in outside reservoirs with large gauge-glasses.*

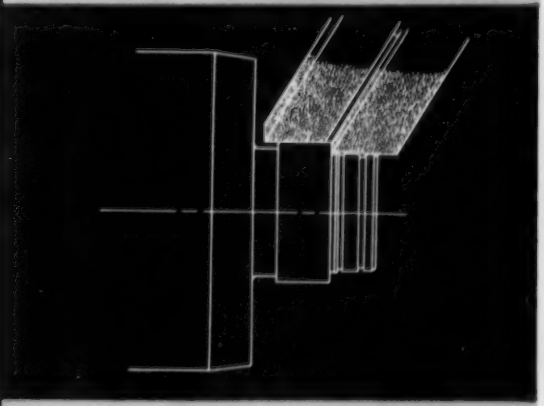
Type CV-4's in YOUR Production

can do the work of two or more ordinary cylindrical grinders. Why not get more facts on how replacing obsolete grinding equipment with these modern machines can improve your competitive position and increase your grinding profits? Ask your Norton Representative for Catalog No. 1658-1, or write us direct. And remember, only Norton offers you such long experience in both grinding machines and grinding wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.





▲ **NEVER DONE BEFORE!** A close-up of one of the Type CV-4 Grinders in the larger photo. Workpieces are being fed into the chuck from a Norton automatic turret-type loading device. An automatic angular plunge grind, followed by automatic traverse off the piece grinds the diameters *and leaves a sharp corner at top of the shoulder* — a new time-saving way to do this job. Stock removal is .025" on diameters and .005" on face. Inset diagram shows surfaces ground and sharp corner left on shoulder. ▼



To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

District Offices: Worcester • Hartford • Cleveland Chicago • Detroit

NORTON PRODUCTS: Abrasives • Grinding Wheels Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes

best on every point

...and among high speed steels the top performer is REX

To leap the hurdle of competition, a product needs performance born of quality. And Crucible's REX® high speed steel has it – in accurate size . . . sound uniform structure . . . dependable response to heat treatment . . . optimum tool performance.

Now, thanks to improved manufacturing techniques, REX is even better – more uniform. Put it to work on your next job, and you'll quickly know why REX is today, as it has always been – *the standard by which all other high speed steels are compared.*

Call for REX at your local Crucible warehouse. Or order it directly for prompt mill delivery. And for a list of available data on REX and other Crucible *special steels*, write now for a free copy of the "Crucible Publication Catalog". *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

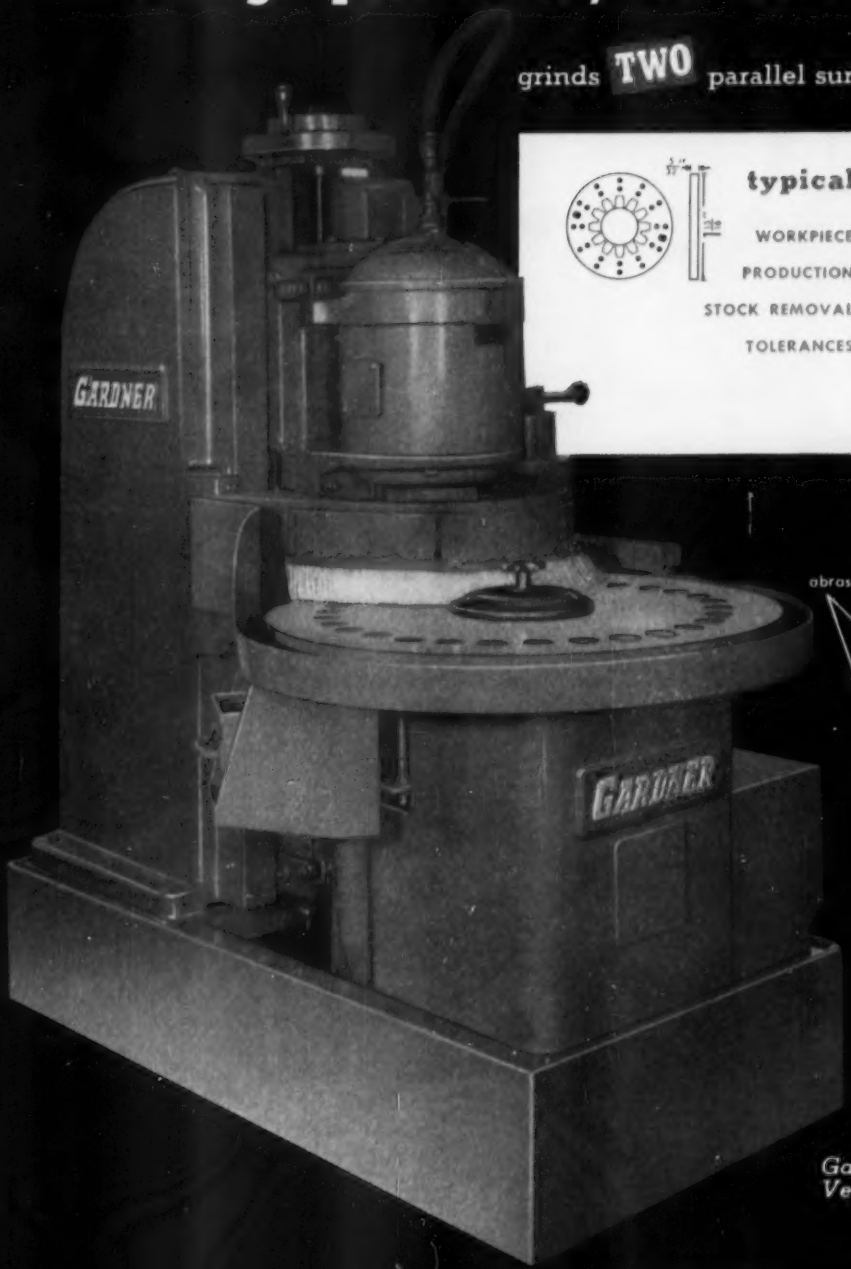
Canadian Distributor – Railway & Power Engineering Corp., Ltd.

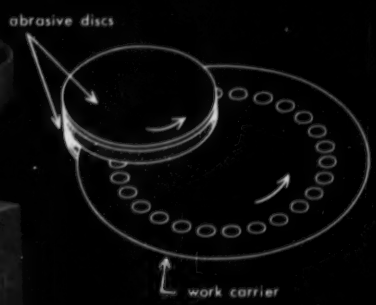
Improved Gardner vertical double disc grinder ...for high production, low cost flat surfacing

grinds **TWO** parallel surfaces in **ONE** operation

typical operation

WORKPIECE	Ceramic switch stators
PRODUCTION	1200 per hour
STOCK REMOVAL	.010" to .016"
TOLERANCES	.002" flatness .002" parallelism .004" uniformity



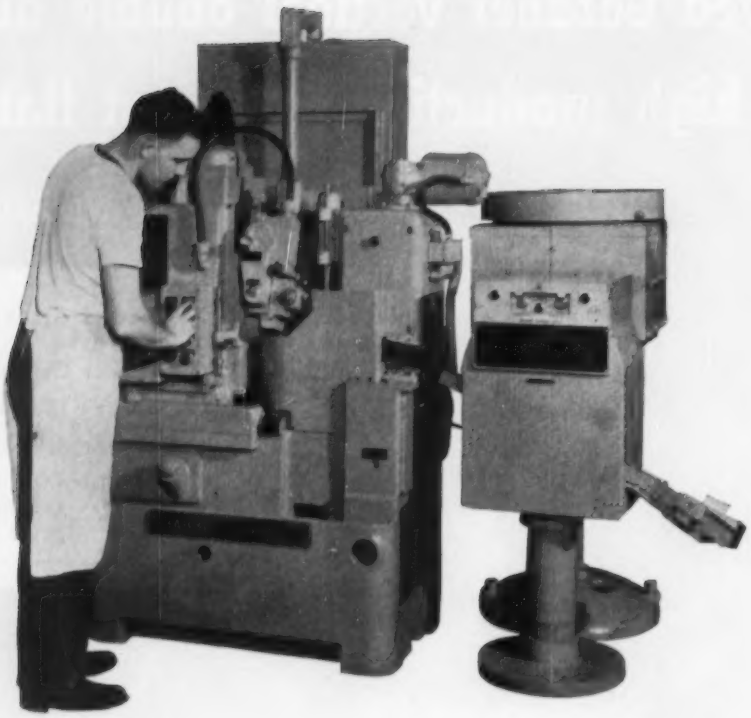


Gardner 2V18
Vertical Spindle Disc Grinder

GARDNER

precision disc grinders

BELOIT, WISCONSIN



HIGH SPEED HOBBING *with automatic handling, loading, gaging*

BARBER-COLMAN

No. 3-6

AUTOMATIC

HOBBING MACHINE

The Barber-Colman No. 3-6 Vertical Hobbing Machine is a high speed machine designed specifically for automatic loading and automatic gaging of parts which are mass-produced. The machine has standard basic elements, but the tooling, loading, gaging and handling are designed for continuous operation and maximum production of a specific part. The high-speed operation of the machine makes it adaptable to all mass-produced parts up to 3" diameter by 6" face width, with maximum pitch capacity of 10DP. Hob speeds for carbide hobbing of non-ferrous and non-metallic blanks are available. Features which contribute to the high-speed operation of the machine include exceptionally large heat-treated and ground bed ways, short drives to the work and hob spindles, and a multiple-thread index worm.

here is a **typical job**

Gear: 18DP, 16 T., 20° P.A., O.D. 1.077"/1.074" face width ⅝", SAE 1330 Steel

Hob: 2¼" x 4" x ¾" bore, single thread, pre-shave, Class C Accurate Unground

Machine: Cycle Time — 1 minute
Feed — .050"/rev.
Speed — 250 SFM
1 Per Load

If you have high production requirements for speedometer and transmission gears, starter pinions, appliance gears, or other mass-produced gear forms, send us blueprints or samples for estimates on automatic handling, loading, hobbing and gaging. Our engineers will show you how this new approach can be integrated into automatic, conveyor or transfer-type production lines to reduce time and cost per piece to a minimum.

High speed and reduced handling cut production time and cost

Automatic Loading

The machine shown here has a vibratory hopper. Blanks are automatically loaded from the hopper by a mechanically operated loading arm. All motions are held in time by keys and tapered pins so that servicing is easy. Gears are ejected and blanks loaded all with the same motion. The loader drive is separate from the machine drive, but electrically interlocked with machine operation. The type and variety of loading devices with which this machine can be equipped are almost unlimited. Loading can be by magazine or conveyor when required.

Automatic Gaging

The gaging mechanism measures PD and rejects those gears oversize or undersize. If a predetermined percentage of gears are cut out of tolerance, the machine stops automatically. Gaging units for checking other gear elements can also be adapted to the machine and are readily available on the market.

Automatic Hob Shifter

Automatic hob shifting is provided to shift the hob a certain amount after each cycle, or it can be arranged to shift after a certain number of parts have been cut. Shifting increments are changed easily by means of a graduated dial. The hob slide is clamped pneumatically.

Centerdistance Adjustment

The hob is set to the proper depth by means of a centerdistance adjusting mechanism. The hob is placed in a fixture, and an indicator finger is set against the outside diameter. The indicator is calibrated to read directly the centerdistance between the work and the hob. This setting is made by means of a graduated dial on the machine and eliminates the usual time-consuming method of setting depth.

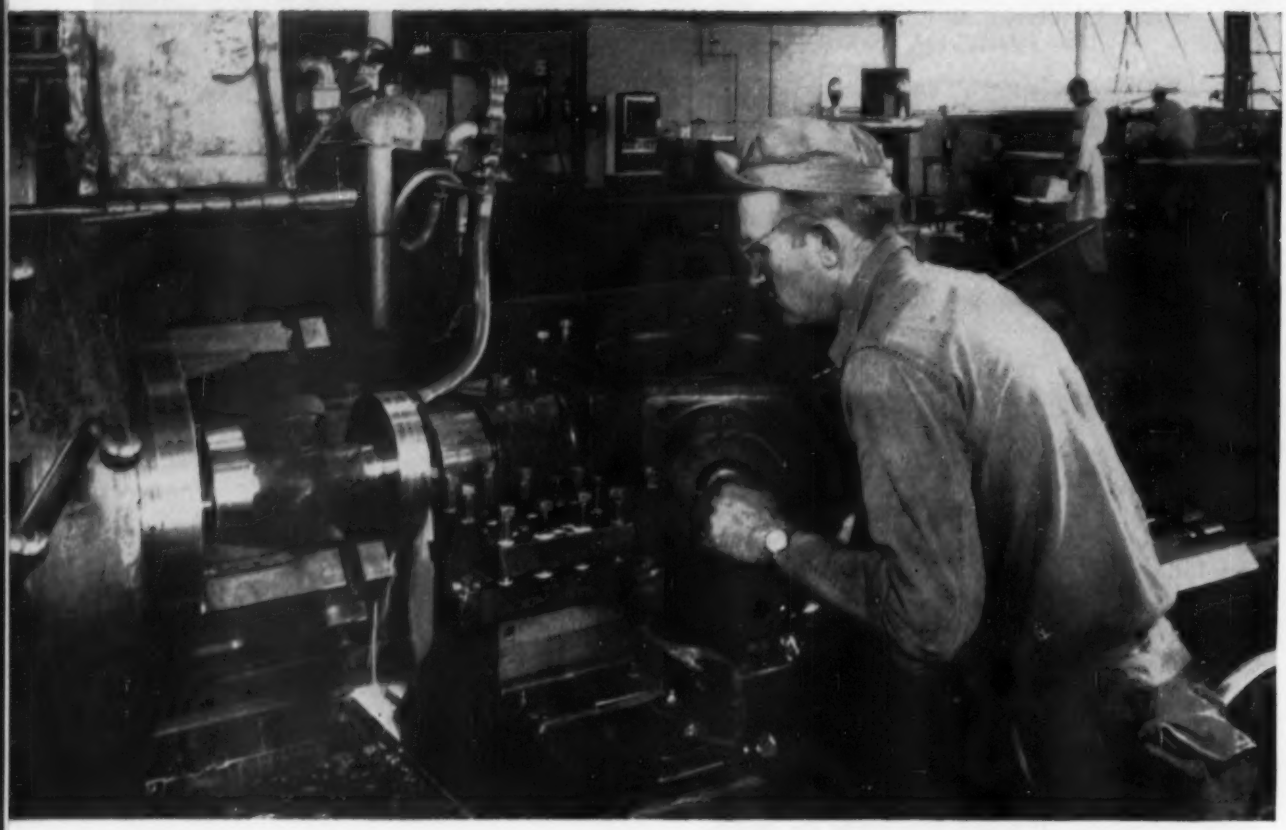
BARBER-COLMAN COMPANY

6112 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

HOW USS "T-1" STEEL IMPROVES



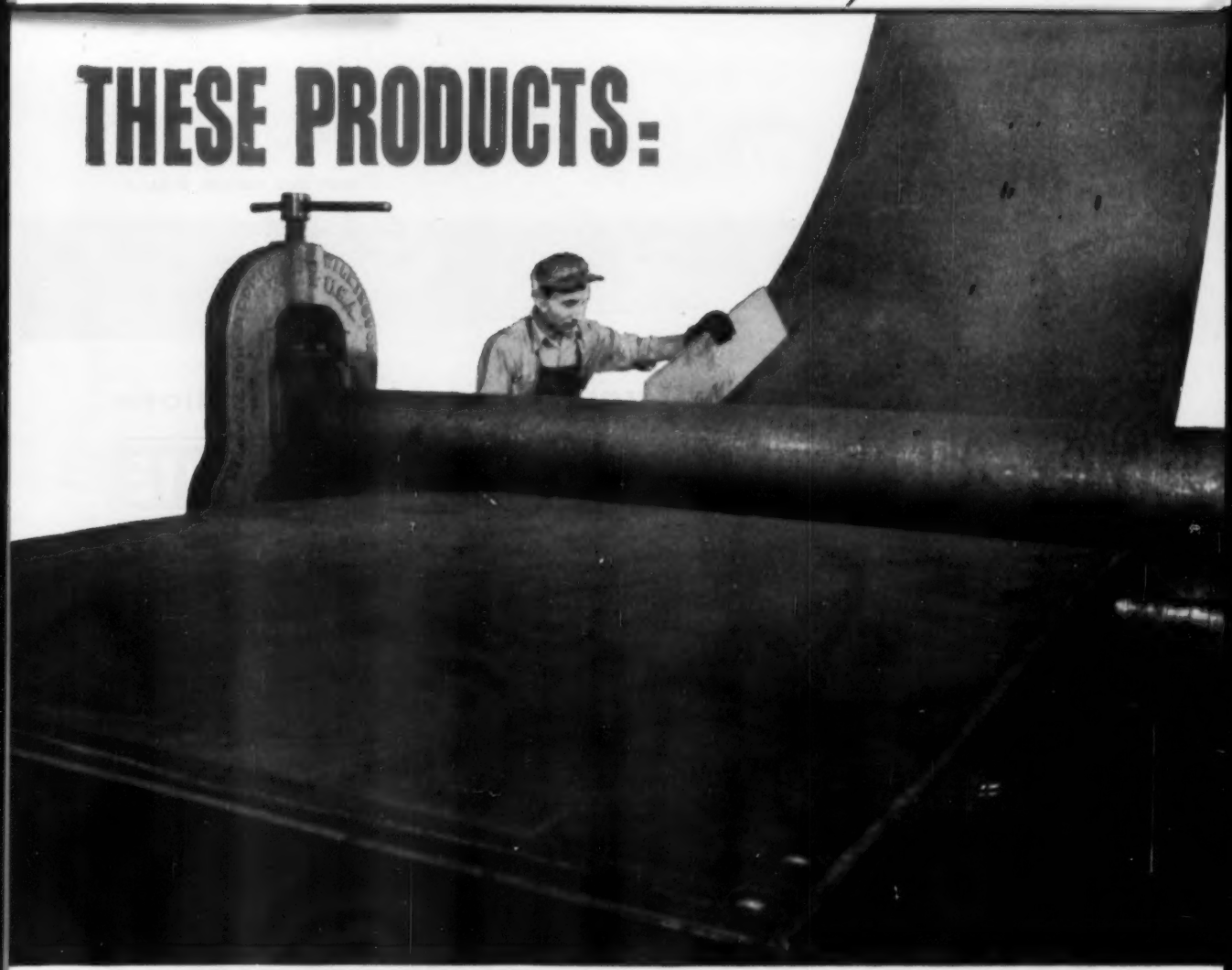
▲

Eliminates Normalizing. A-1 Bit and Tool Company, Houston, Texas, has converted exclusively to USS "T-1" Steel for jigs and fixtures on its turret lathes. The reason: USS "T-1" Steel, being already heat-treated, doesn't require normalizing before final machining. "T-1" doesn't warp and distort during welding, and it is easy to weld. Jigs now are machined, welded, and ready for mounting. USS "T-1" Steel saves money, speeds production, and reduces rejects.

◀

Increases Durability of Buckets. Oaks Welding, Incorporated, Columbiana, Ohio, repairs mining equipment on a custom basis. They rebuilt the 4½-yd. dragline bucket shown here with USS "T-1" Steel. Sides, bottom, and runners were made from USS "T-1" Steel . . . are actually far stronger and more durable than when the shovel was new . . . are better able to withstand severe impact abrasion in all kinds of weather.

THESE PRODUCTS:



▲ **Simplifies Fabrication.** Fairmont Machinery Company, Fairmont, West Viriginia, is using USS "T-1" Steel in thicknesses up to ⅜ inch to build an *unlined* coal storage bin. "T-1" Steel's abrasion and corrosion resistance make it an ideal choice for this type of service. In fabrication, high-yield-strength USS "T-1" Steel was cold formed on equipment normally used to form carbon steel.

This new coal storage bin will be welded in the field to cut costs. It will be simpler to build because it will need fewer stiffening members and will be lighter in weight than typical coal storage bins.

HOW IT CAN HELP YOU

USS "T-1" Steel, with its high minimum yield strength of 90,00 psi and its minimum tensile strength of 105,000 psi, can help you design or build lighter-weight equipment that will last longer. Its unusual toughness can help you design or build equipment capable of taking severe impact abuse at sub-zero temperatures. Its excellent weldability can help you to cut the cost of fabricating highly stressed parts and to reduce repair and maintenance expenses. Its good creep rupture strength can help you to put more durability in equipment that operates at temperatures as high as 900 degrees F.

Somewhere in your operation, versatile USS "T-1" Steel can help you. Write, wire, or phone United States Steel, Pittsburgh 30, Pennsylvania.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

SEE THE UNITED STATES STEEL HOUR. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

USS "T-1" CONSTRUCTIONAL ALLOY STEEL USS

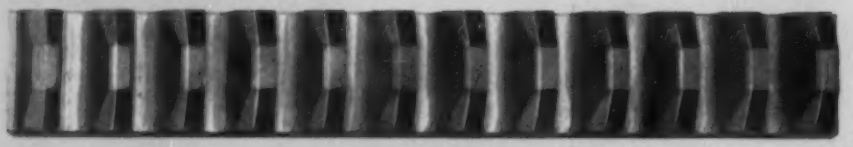
UNITED STATES STEEL

240" GAS TURBINE BROACH

in all your broaching operations

. . . you should use LAPOINTE

CARBIDE TIP "PINE TREE" BROACH



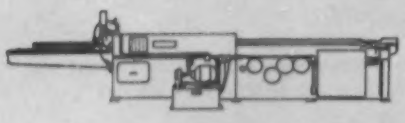
CARBIDE SURFACE BROACH

COMPRESSOR HOLDING SLOT BROACH FOR GAS TURBINES

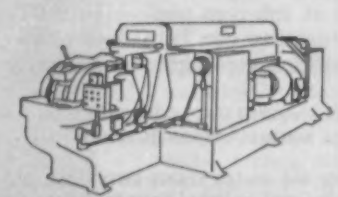
VARIABLE PITCH TOOTH SURFACE BROACH

Electrolized BROACHES,
exclusive with Lapointe, increase life between grinds as much as 2 to 10 times!

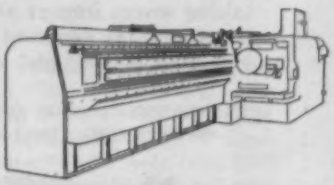
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



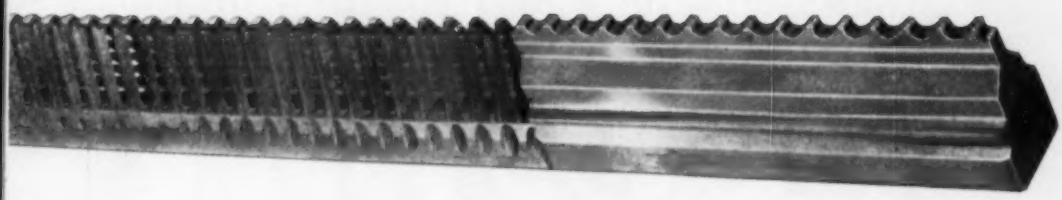
60" STROKE HORIZONTAL, ELECTRIC



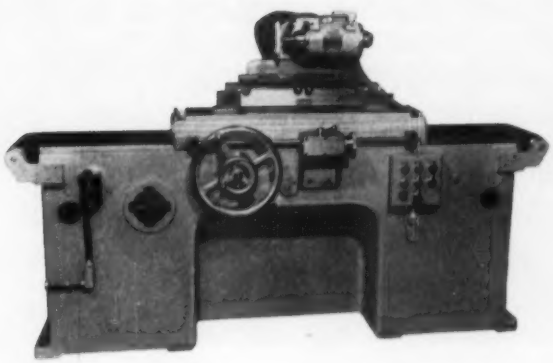
CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC



BROACHING TOOLS!



BROACH SHARPENER, 36-inch size, designed for sharpening small surface broaches. Completely modern and efficient, and easy to use, it will save time and money in any plant. Universal models available, in three sizes: 60", 72" and 80" capacity between centers. Write for literature.

It's only logical that you should place full responsibility on LAPOINTE for the success of your broaching program.

Plants that convert to Lapointe-Broaching find that they *are relieved of all broaching problems* when they use Lapointe-built broaching tools and Lapointe-built broaching fixtures on their Lapointe broaching machines.

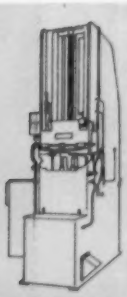
Using steel poured to our own proven analysis, and constantly under Lapointe quality-control, we make broaches for automotive involute gears, "pine tree" form broaches for jet engines and stationary gas turbines, and all the conventional types of surface and internal broaches.

Carbide-tooth broaches, now completely practical because of high speed Lapointe electro-mechanical drive broaching machines, can help substantially in holding down production costs in your plant.

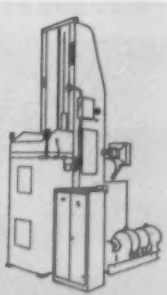
In these increasingly competitive times, we suggest that you let a Lapointe Field Engineer discuss broaching tools with you. He can give you some money-making ideas!

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS • U.S.A. In England: Watford, Hertfordshire

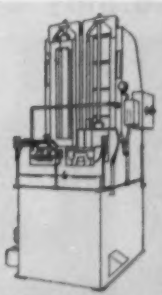
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE
known to be the best in
BROACHING

the latest word in low cost machining

televersal

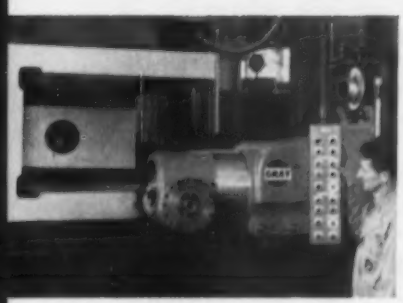
This new GRAY TELEVERSAL head tremendously increases machining range. Conveniently applied, quickly positioned, its great rigidity permits highest horsepower milling cuts.

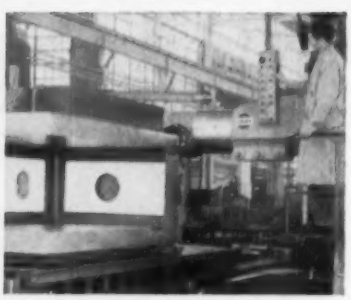
The large diameter quill may be swiveled to permit any angular cut. A triple-straddle clamp inflexibly locks the quill to the cast pyramid body.

Designed to keep the job low and yet permit great machining range. Ideal when used with column cross travel of the new GRAY horizontal, boring, drilling and milling machine.

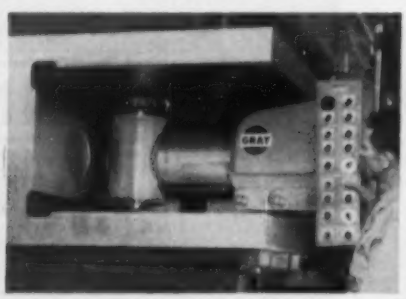
Not just an attachment, but a high power massively built, heavy milling unit that offers a new concept in versatility.

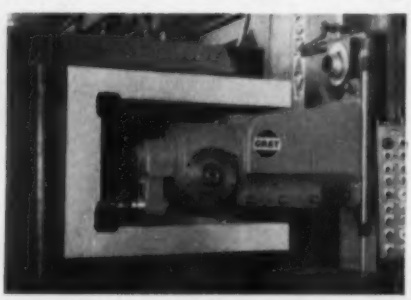
The G. A. GRAY Co., Cincinnati, Ohio



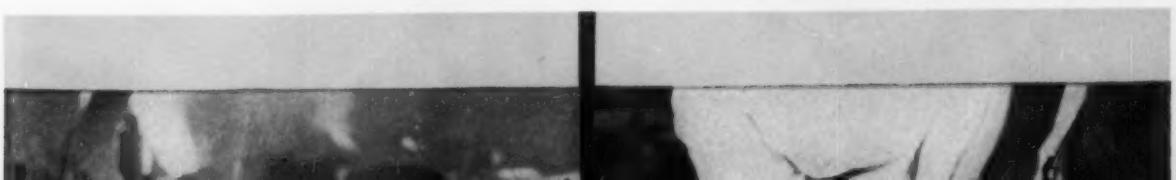


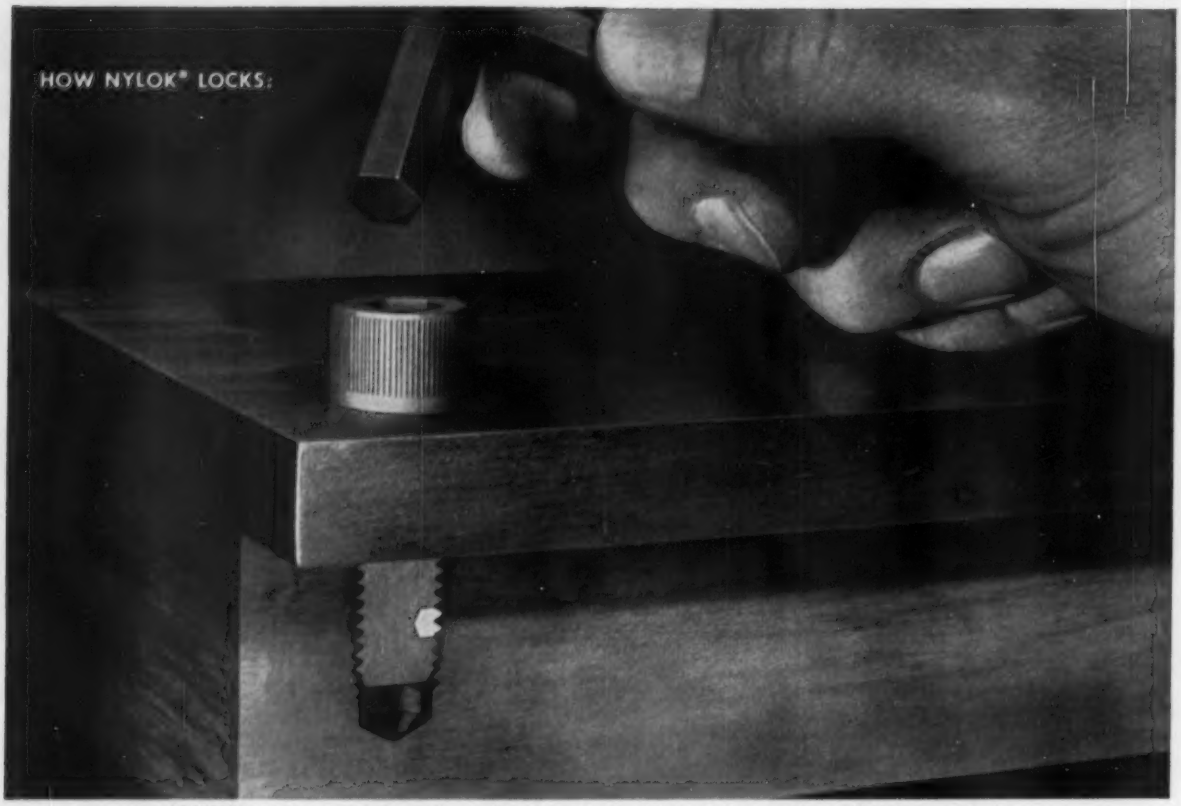
six different surfaces and more ... and only ONE work-setting





GRAY
GRAY
GRAY





LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together, and locks the screw securely.

NEW—a complete line of self-locking UNBRAKO socket screw products that won't work loose

They simplify design and save production time

UNBRAKO socket screws are now available embodying the Nylok* self-locking principle. Nylok provides a truly practical new solution to the problem of making screws self-locking.

You save production time when you build products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. So are cotter pins and complex multiple set screw installations.

Self-Locking UNBRAKOS are completely reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, on properly seated screws, the pellet acts as a liquid seal.

Self-locking UNBRAKO socket screws come in a complete range of standard sizes and materials. See your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

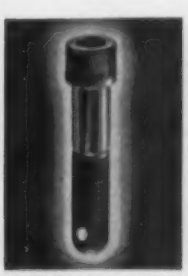
T.M. Reg. U.S. Pat. Off., The Nylok Corporation

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

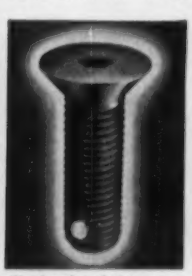
SPS

JENKINTOWN PENNSYLVANIA



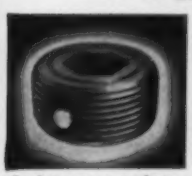
Socket head cap screws. Standard sizes #6 to 1 in.

Socket shoulder screws. Standard sizes ¼ to ¾ in.

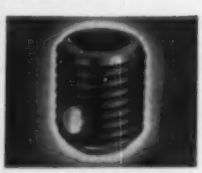


Flat head socket screws. Standard sizes #6 to ¾ in.

Button head socket screws. #6 to ⅜ in.



Socket pressure plugs. Standard sizes ⅛ to 1¼ in.



Socket set screws. All standard point types. #6 to 1 in.

THE BFR WHEEL is outstanding for light weld grinding, blending contours and corners, removing rust and scale, scarfing and beveling before welding. This soft-action, semi-flexible hub-type wheel has cotton fabric reinforcement with additional layer of Nylon.

THE BD WHEEL is ideal for heavier weld grinding jobs, smoothing flame-cut edges and stainless steel welds, many slotting, notching and cutting-off operations and removing light fins from castings. Glass cloth plus Nylon is the reinforcement in this rigid hub-type wheel.

LIGHT or HEAVY

Norton Reinforced Wheels bring the money-saving "TOUCH of GOLD" to countless weld grinding jobs

Two of the most popular Norton reinforced hub-type wheels — the semi-flexible BFR for light duty and the rigid BD for heavier work — make a team that can't be beaten for all-around usefulness. Separately, each handles a considerable number of grinding jobs. Together, they cover an almost endless list of applications, ranging from lightest scale removal to finishing heavy stainless steel welds. And they do every job with the extra safety, service life and economy that adds the profit-building "Touch of Gold" to your grinding operations.

Where regular type abrasive wheels are called for, remember that the Norton line is 100% complete, with shapes and sizes for every application. In particular, B-11 resinoid bonded wheels for your heavier jobs have the uniformity of structure and perfect balance that results in easier, faster, more profitable grinding.

See Your Norton Distributor or write the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1710

NORTON
ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cut Tapes

REJECTIONS dwindle to a new low when you start running on USS Free-Machining MX Steel.

It's a fact. Ever since this faster-cutting bar stock was developed, and in every shop where MX has been put to work, not only have more parts per hour been produced but they have been *better* parts. Better in finish, accurate in dimension, lower in cost—and with fewer rejects to cut into profits.

These highly desirable results are obtained with USS MX primarily because of its superior machinability, and also because this steel is consistently uniform in shipment after shipment. Uniform in cutting characteristics. Uniform in its composition and grain size. Uniform in freedom from defects and injurious imperfections.

Give USS MX a trial in your shop and watch production go up and costs come down. The performance of MX has been so universally superior that we feel sure that it will cut the cost of any part you now machine from ordinary screw stock.

USS Free-Machining MX is produced in both Bessemer and Open Hearth grades and is available in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output... longer tool life... fewer rejects
—when you do the job with free-machining
MX

USS

UNITED STATES STEEL

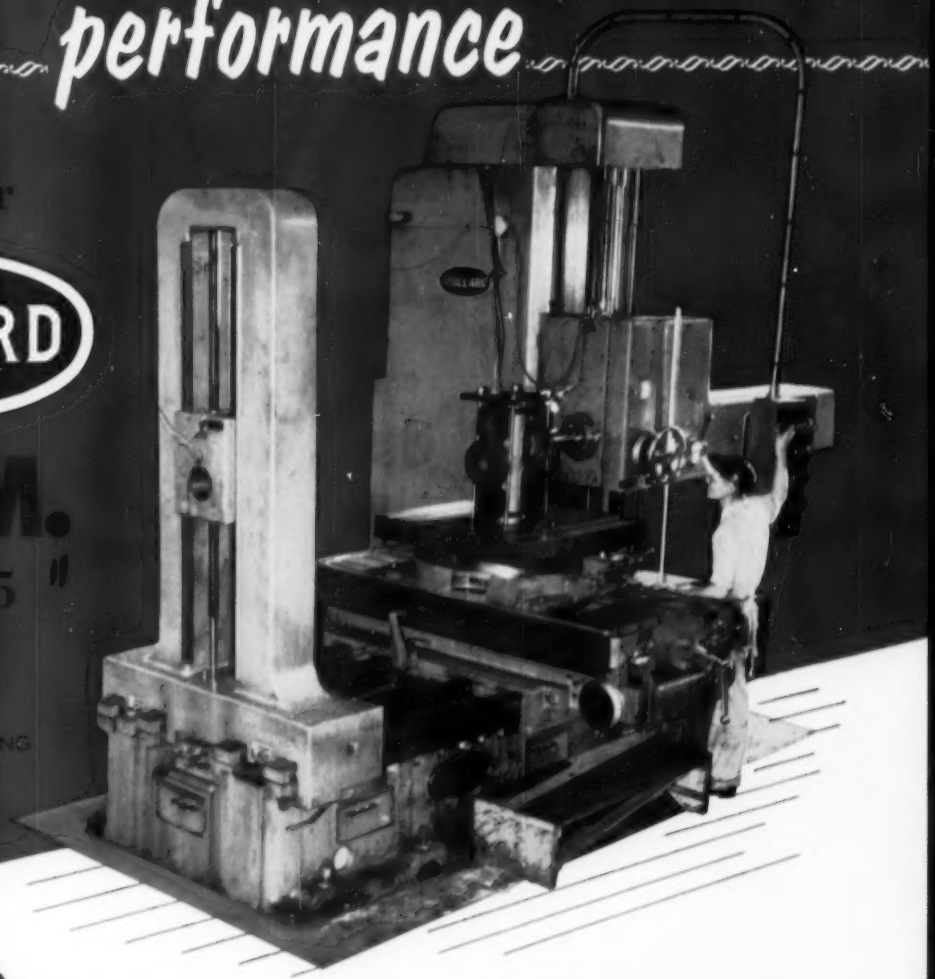
"we're getting TOP performance

from our

BULLARD

H.B.M.

Model 75"



GAS CYLINDER CASTING FOR COMPRESSOR

"The acquisition of our Bullard HBM, Model 75 has eliminated a production bottleneck by giving us a reliable machine to handle our output" says Mr. Frank A. Kocevar, Chief Industrial Engineer at The Joy Manufacturing Co., of Michigan City, Indiana, manufacturers of portable and stationary compressors for industry.

This "built-in reliability" of the Bullard HBM, Model 75 can be applied to your boring, milling, drilling and facing problems — check its outstanding features by calling your nearest Bullard Sales Office or Distributor or for a complete catalog, write to —

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

MOST USEFUL HAND SCREW MACHINES ON THE MARKET

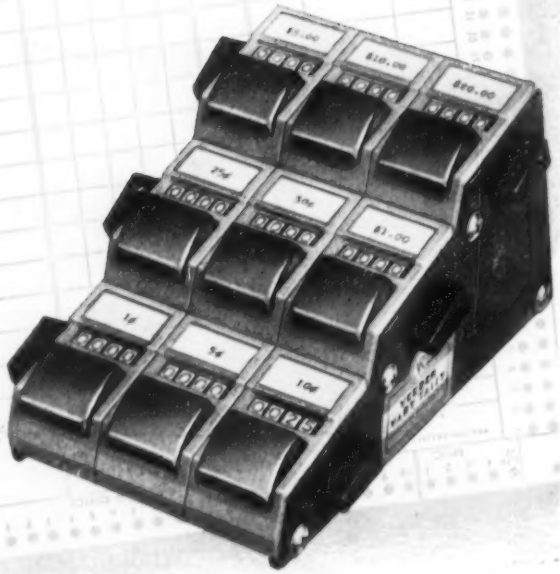
NEW Stock-Control System based on VEEDER-ROOT Vary-Tallies

saves time...
speeds production...
stops errors

Manufacturers of skirts (or skis) can speed and simplify their stock-keeping, accounting, and payroll records with simple punched-card systems based on Vary-Tallies. A leading skirt-maker, for instance, always has complete command of several variations of styles, sizes and colors simply by lifting out the cards for any of these classifications . . . and recording them on the Vary-Tally. This gives him an instant accounting on any account, without pencil tallies, scratch marks, or telltale marks on the goods.

In time-checking, this manufacturer has tallied 420 items on 80 orders in 4½ minutes. *His best previous time was 40 minutes.* No copying . . . nothing but the final totals on the counter-faces.

What Production Systems Inc., Waltham, Mass., is doing for the garment industry with its "Quik-Pik" System . . . *you* can do for yourself with a similar system based on Vary-Tallies. And you can count on Veeder-Root to help you. Write:



Hartford, Conn. • Greenville, S. C. • Chicago
New York • Los Angeles • San Francisco • Montreal
Offices and Agents in Other Principal Cities

VEEDER-ROOT INC.
"The Name that Counts"

MOST USEFUL HAND SCREW MACHINES ON THE MARKET

... the Brown & Sharpe Nos. 00, 0, and 2

You can handle the widest range of short run work and second operations, with highest productivity and economy, on Brown & Sharpe Hand Screw Machines. They provide the same spindle speed versatility as B&S Automatics: 196 2-speed combinations, providing a wide range of high to low ratios. In addition, they use the same tools, collets, and fingers as equivalent-size B&S Automatics — set-ups are exactly the same! Operation is easy too. For example: A convenient lever controls both high and low spindle speeds, and braking. "Natural position" turret control reduces operator fatigue. A handy trip-lever controls chucking and bar feed. For highest efficiency and economy, put your short runs and make-up jobs on B&S Hand Screw Machines. *Write for details.*

Brown & Sharpe Mfg. Co.,
Providence, R. I.

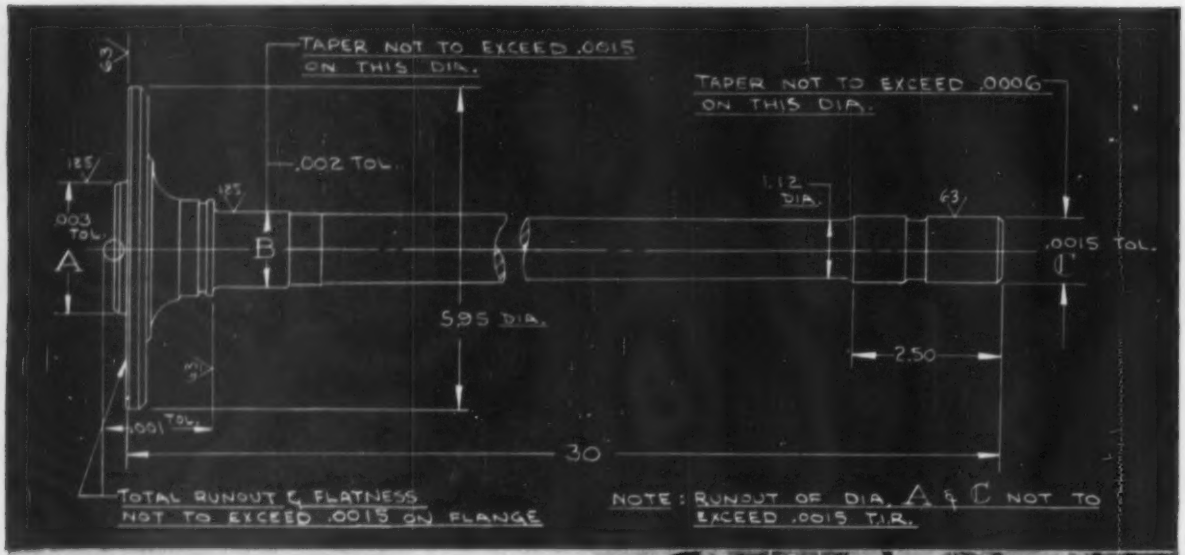
Ask About Our Pay-As-You-Depreciate Machine Tool Plan

- *Greatest number of spindle speed combinations*
- *Exclusive tool interchangeability with B&S Automatics*
- *Easiest to set up and operate*

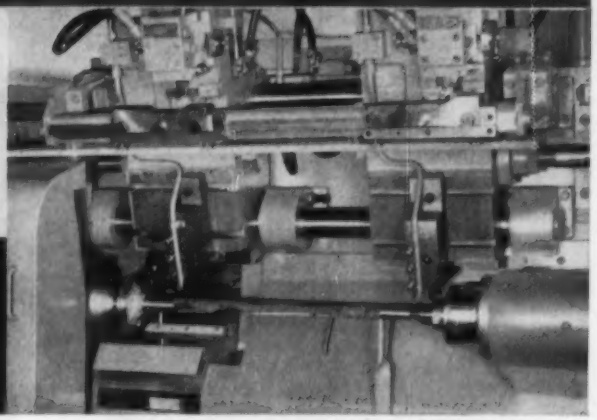
Brown & Sharpe

B·S

No. 0 Hand Screw Machine



A completed Ford axle is shown (right) in position on the REEDMATIC Lathe. Note how the top support design leaves machine front unobstructed to make loading easier, reduce operator fatigue, and allow unobstructed chip drop for collection at base of machine. Sketch at top shows tolerance held by the REEDMATIC Lathe for each cut. Photo above shows rough forging and finished axle.



REEDMATIC® Production Lathes Turn Rear Axles at Ford, ELIMINATE EXPENSIVE GRINDING OPERATIONS

At Ford Motor's new Sterling plant, the use of 14 REEDMATIC® Production Lathes to turn rear axle shafts has eliminated two expensive grinding operations. This is made possible by the extreme accuracy and fine finishes obtained through Reed-Prentice's new, two-dimensional tracers.

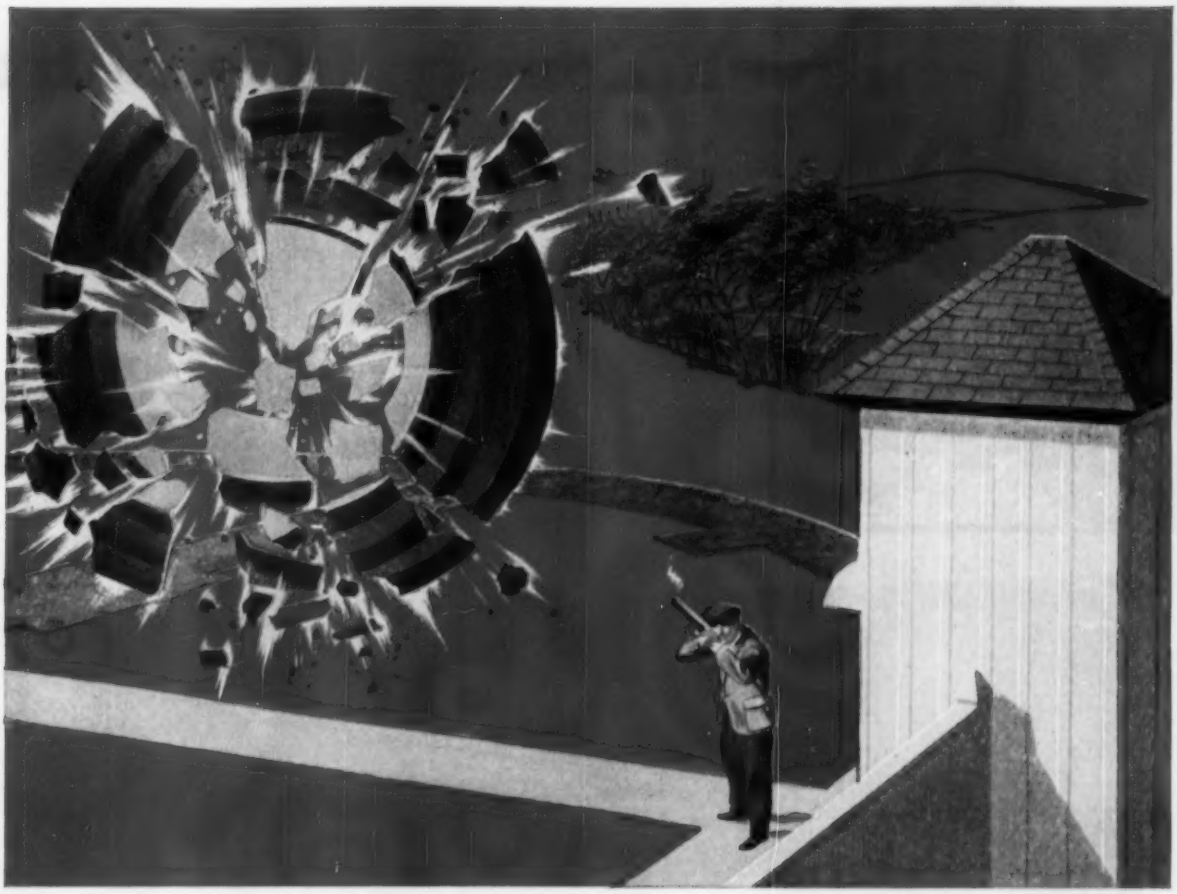
Mounted at 90° to the centerline of the spindle, three REEDMATIC tracer controlled slides permit both multi-cycle and finish turning of all dimensions in one setting. Template control assures uniformity. Ford gets a higher production rate, too, along with top quality. Cutting on these alloy steel axle forgings is accomplished at *1,600 surface feet per minute*. Tool life is substantially increased, and production time is reduced on subsequent operations.

You can get complete information on the all-new REEDMATIC Production Lathe . . . find out about the exclusive features it offers . . . by contacting our distributing agent, Burleigh & Stocker Machine Tool Co., at Pleasant Ridge, Michigan. Or, you may write Reed-Prentice Corp., at the address below.

REED-PRENTICE

Affiliate of PACKAGE MACHINERY COMPANY

677 CAMBRIDGE STREET, WORCESTER 4, MASS.



"Finish first in your league"
...with J&L 1200 COLD FINISHED STEELS

When your machining applications require a steel that's tops in quality, machinability, uniformity and surface finish—"J&L 1200" Cold Finished Steel is the answer. It's one of a complete line of premium quality, free-machining bar steels developed over the years by J&L specialists. Thus, we can recommend the right type to help solve your problems.

Operators in shop after shop around the country using "J&L 1200" report:

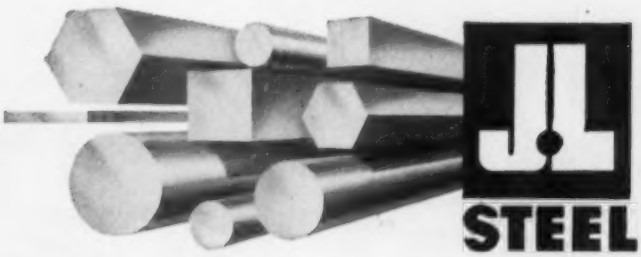
- Better machine finishes
- Improved tool life
- Increased machining speeds
- Greater uniformity

"J&L 1200" grades, available in all standard shapes and sizes, meet the compositions published by the American Iron & Steel Institute (AISI C-1213) . . . Society of Automotive Engineers (SAE 1113) . . . and Federal Specification QQS-633.

Use this steel in your own shop to secure better work at lower over-all costs. Results will convince you "J&L 1200" deserves to be a regular specification for your production runs.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor today for prompt and efficient service.

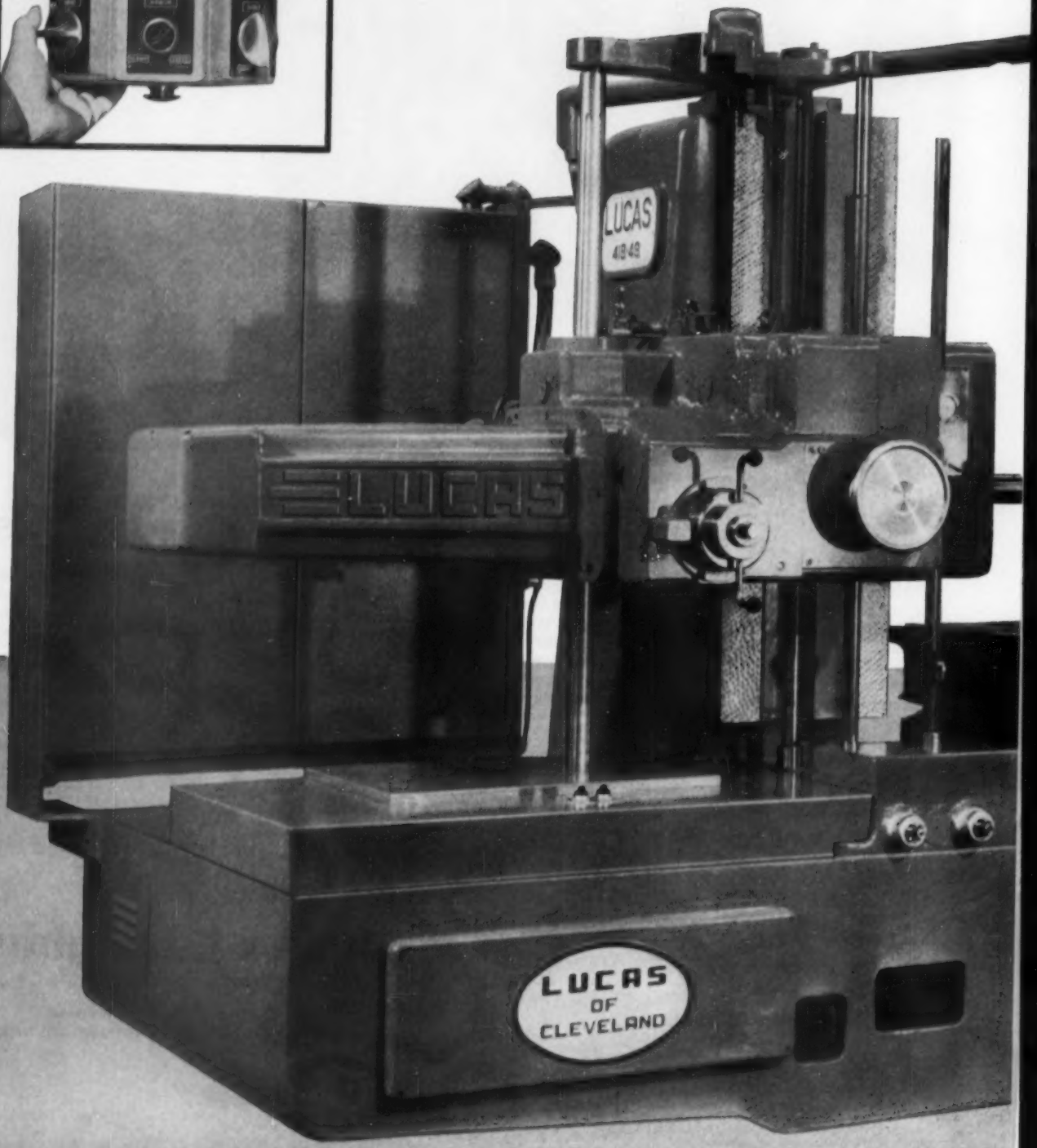
Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT
PITTSBURGH, PA., AND HAMMOND, IND.

revolutionary full-control

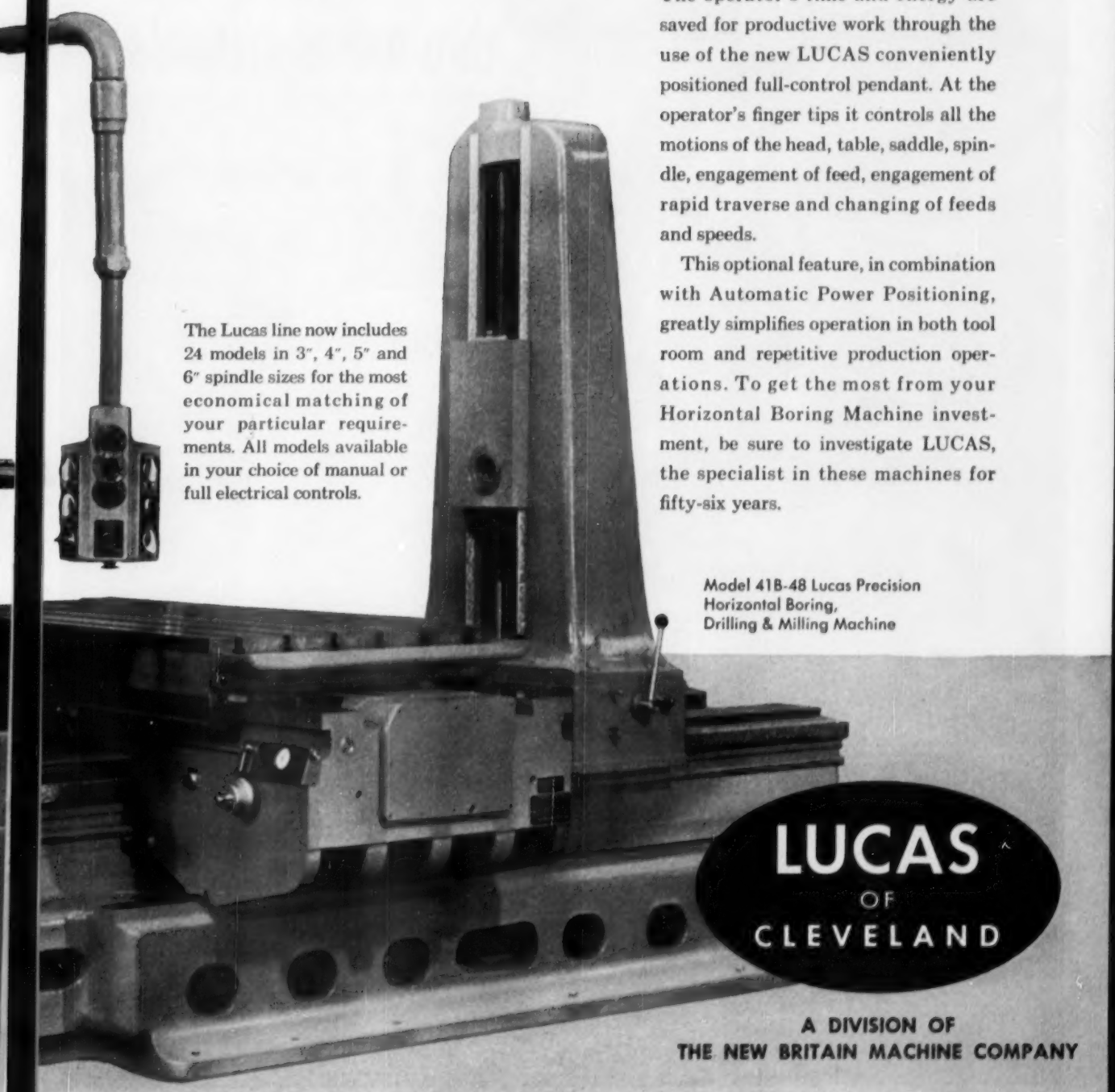


pendant handles all motions of the Lucas — faster

The operator's time and energy are saved for productive work through the use of the new LUCAS conveniently positioned full-control pendant. At the operator's finger tips it controls all the motions of the head, table, saddle, spindle, engagement of feed, engagement of rapid traverse and changing of feeds and speeds.

This optional feature, in combination with Automatic Power Positioning, greatly simplifies operation in both tool room and repetitive production operations. To get the most from your Horizontal Boring Machine investment, be sure to investigate LUCAS, the specialist in these machines for fifty-six years.

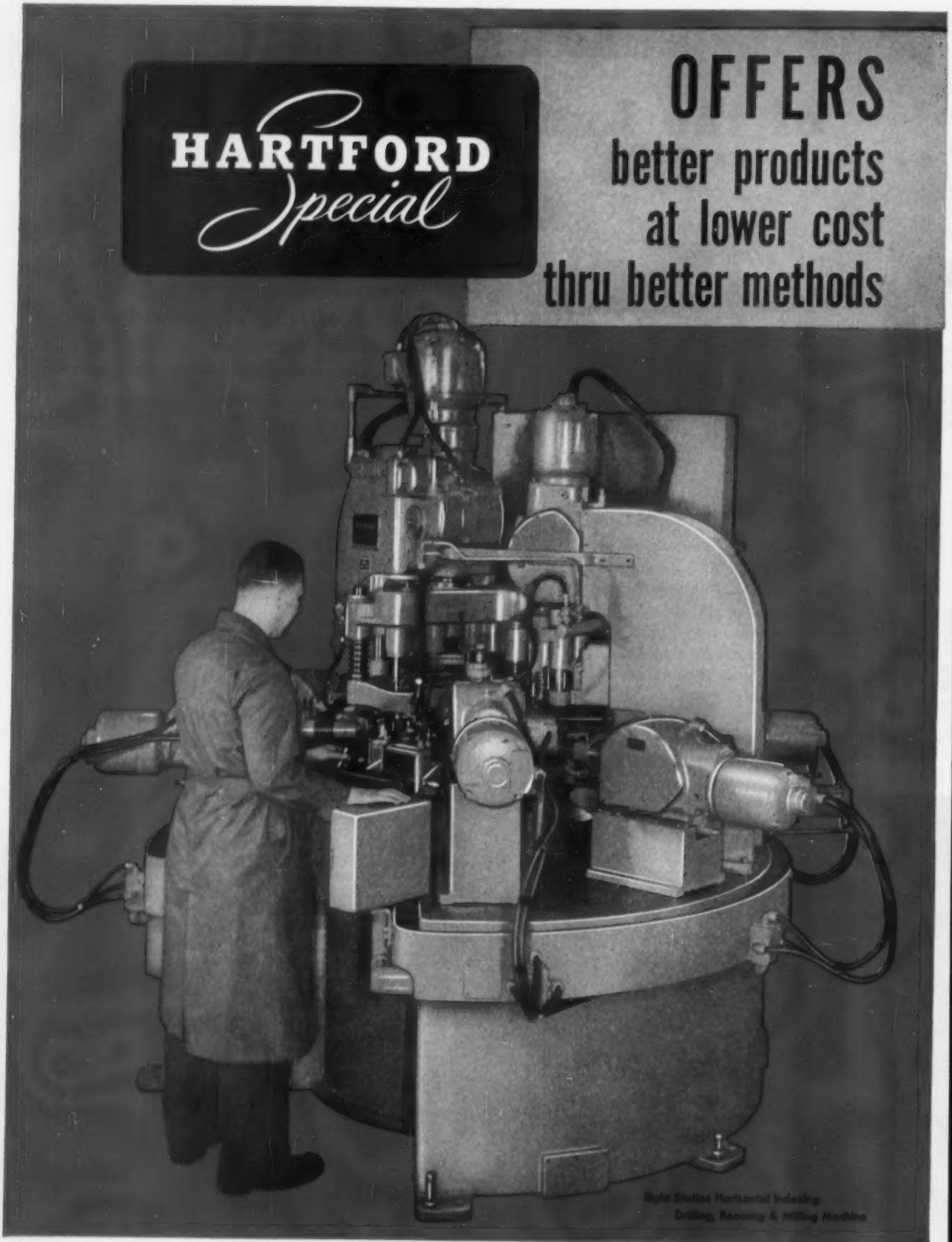
The Lucas line now includes 24 models in 3″, 4″, 5″ and 6″ spindle sizes for the most economical matching of your particular requirements. All models available in your choice of manual or full electrical controls.



Model 41B-48 Lucas Precision Horizontal Boring, Drilling & Milling Machine

LUCAS OF CLEVELAND

A DIVISION OF THE NEW BRITAIN MACHINE COMPANY

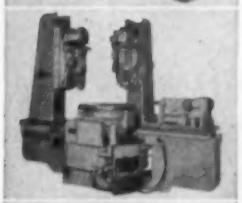

HARTFORD Special
OFFERS
better products
at lower cost
thru better methods
Eight Station Horizontal Indexing
Drilling, Reaming & Milling Machine

ONE SOURCE FOR BOTH

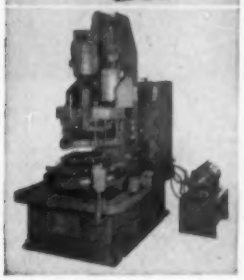
Automatic Production Machines

Double End Trunnion Type Machine

Center Column Indexing Type Machine

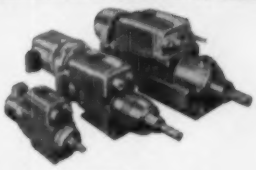


Universal Drilling Machine for jet aircraft components



Vertical Single Unit Multiple Spindle Indexing Machine

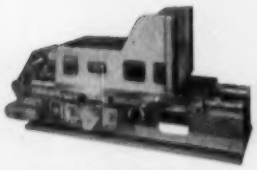
Standard Machine Components



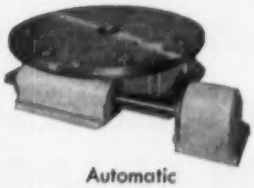
Quill Type Air Hydraulic Drill Units

Quill Type Cam Units

Quill Type Lead Screw Tapping Units



Way Type Hydraulic Feed Units



Automatic Index Tables Horizontal and Vertical

Machine Bases

Designing and building automatic production machines like those illustrated are a "Hartford" specialty. Years of experience have proven that dependable high production and economy can best be brought to the user by means of standard machine components.

Now Hartford Special offers these production tested components to users for machines of their own construction.

Consult Hartford engineers for either—completely tooled machines or components.

HARTFORD Special

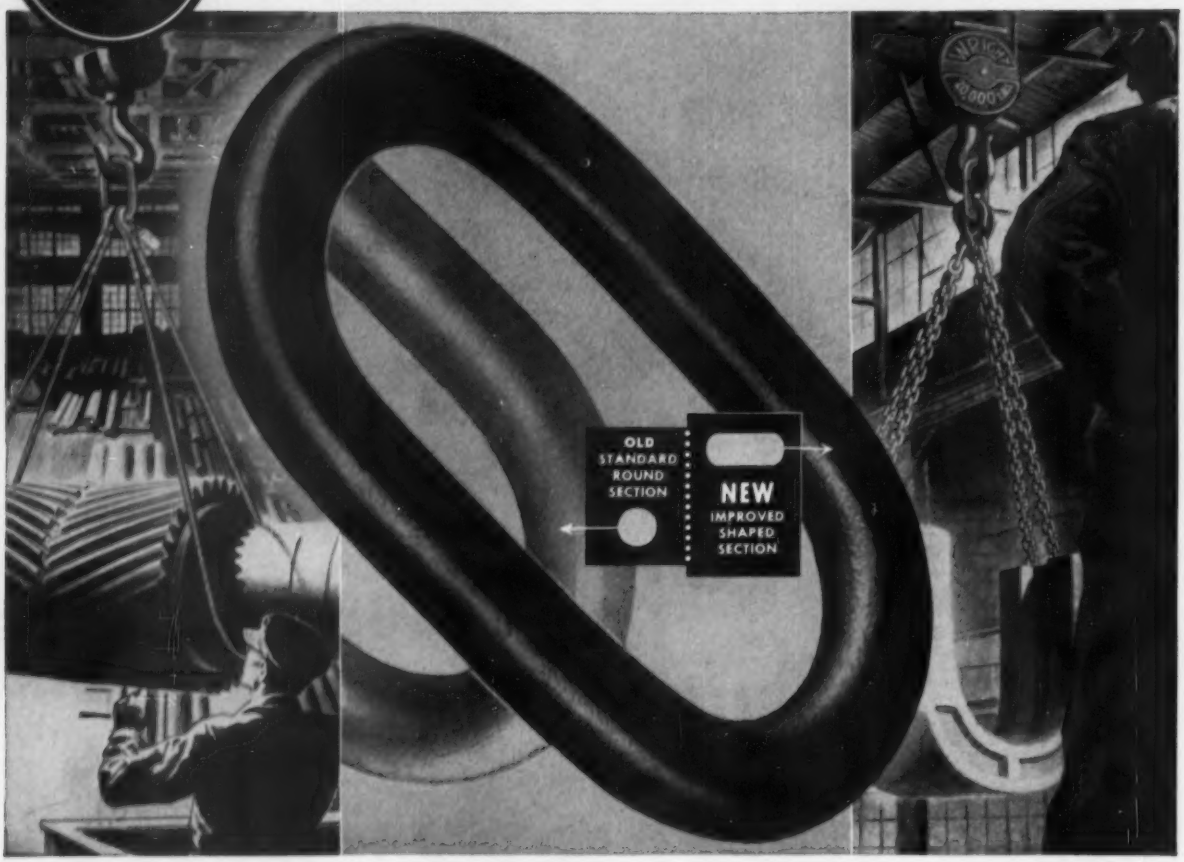
MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
28212 HOMESTEAD AVE., HARTFORD 12, CONN.

Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.

ACCO products

ACCO Registered* Slings–Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY



An Extra Bonus of Safety for Slings—
THIS NEW SHAPED MASTER LINK

• ACCO's engineers found that if they shaped the master links for chain and wire rope slings as shown above, these new shaped links would hold their form under loads up to 18% greater than could the old standard round links. The reasons are similar to those which enable a shaped I-Beam to handle greater loads than could the same amount of steel if used as a solid beam.

The new link is smoother and provides a greater factor of safety. It is a better link in many ways. It costs us more to make. Yet it is offered at no increase in price.

"Registered*"—for Greater Safety

Development of this new link is just the latest step in ACCO's continuing program to provide the greatest possible measure of safety and reliability in ACCO *Registered* Slings.

Each component of an ACCO *Registered* Sling is made from the best materials procurable for its use. Each part must prove to have strength equal to or greater than the sling body. All hooks for ACCO *Registered* Slings are Magnaflux tested. Then these components are assembled into slings according to carefully engineered designs that have proved themselves in rigorous field tests.

The completed sling is then individually proof-tested to twice the working load limit for which it is rated. Then, and only then, is it awarded the coveted ACCO Registration Certificate and the identifying ring or tag.

*Trade Mark Registered

See your Distributor

ACCO *Registered* Slings are readily available from a distributor near you. If you don't know him write to our Bridgeport office for his name.

ACCO

AMERICAN CHAIN & CABLE

BRIDGEPORT, CONN.

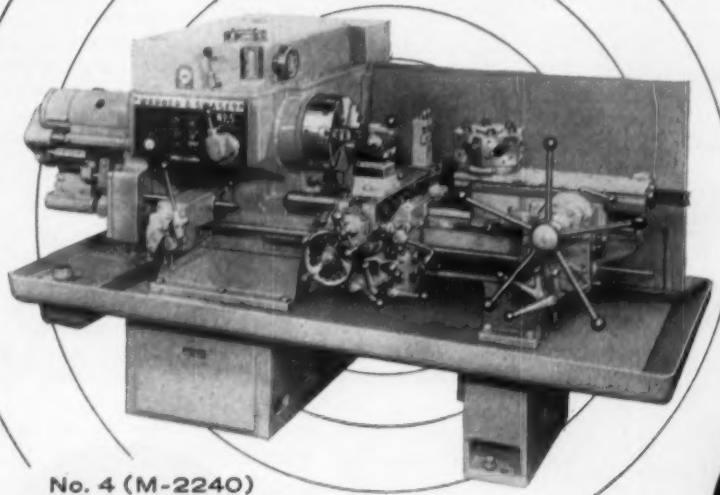
Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Better Value

Super-Spacer.

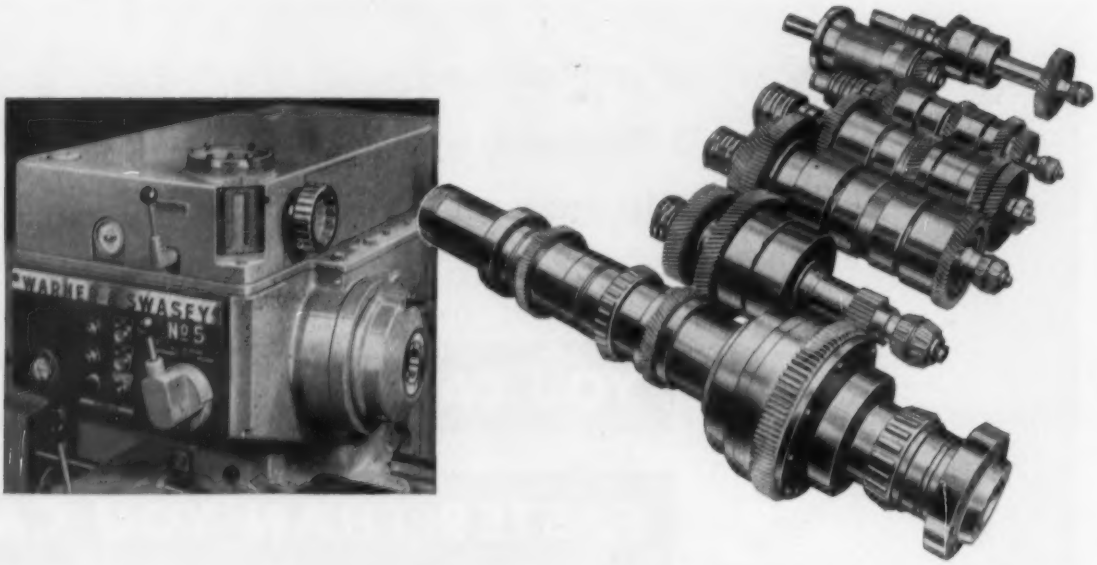
On new Warner & Swasey
No. 4 and No. 5 Turret Lathes with
new all-hydraulic headstock...

YOU CAN CHANGE SPEEDS
FASTER THAN YOU CAN
TURN THIS PAGE!



No. 4 (M-2240)
2" Bar Capacity—18⅛" Swing
No. 5 (M-2250)
2½" Bar Capacity—20" Swing

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880



INSTANTANEOUS SPEED CHANGES

WITH THE FLIP OF A LEVER

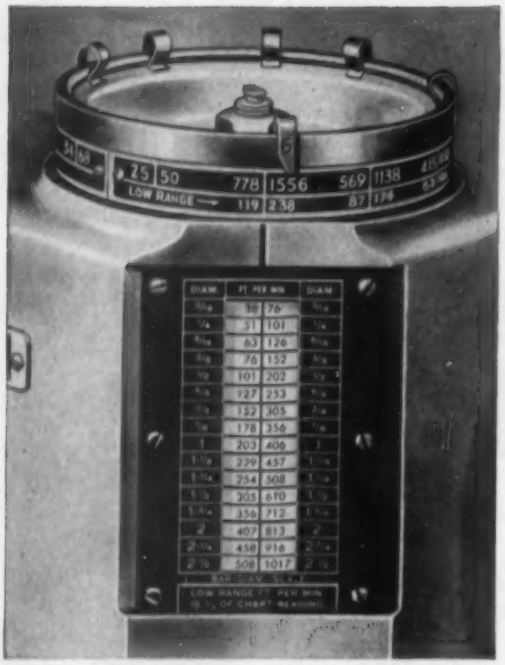
DIRECT-ACTING hydraulic clutches, with a constant-mesh gear train, eliminate all gear shifting on these new Warner & Swasey Ram Type Turret Lathes. Clutches engage smoothly and quickly, providing fast starts, stops, and reverses. Clutches never need adjustment.

With the patented speed preselector the operator can select a new spindle speed while under cut and with a mere flip of a lever, change speeds instantly.

A flip of the speed change lever in the opposite direction provides a valuable 6 to 1 speed reduction for threading or forming cuts —instantly and without preselection.

A total of 12 spindle speeds, or 24 unduplicated speeds with a two-speed motor, are available on these new machines. A touch of a button doubles or halves the speed, and when used in conjunction with the 6 to 1 speed change, four spindle speeds are instantly available with only one setting of the preselector.

A separate master lever controls forward, reverse, brake and neutral. *Zoned controls* on headstock and apron put them all within easy reach of the operator—cutting fatigue, speeding his work, putting more pieces on the floor every hour of every day!



Warner & Swasey's direct-reading, patented speed preselector is calibrated in work diameter, surface feet, and spindle rpm's—which, with the new ease of changing speeds, encourages the operator to use the proper spindle speed.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

Sick slab roll recovers fast with application of STANOGEAR Compound

Eugene Ewald (right), Mill Foreman, and Marshall Fox, Standard Oil lubrication specialist, inspect slab roll. STANOGEAR Compound helped solve lubrication problem on roll neck bearings.

Marshall Fox who proposed switch to STANOGEAR with resultant improved operation, is experienced in providing such technical service. Marsh has a Mechanical Engineering degree from Purdue to qualify him for this work. In addition, he has completed Standard's course for sales engineers. This experience and training, customers find, pay off for them.

A slab roll at Matthiessen & Hegeler Zinc Company, La Salle, Illinois, was sick. It suffered from repeated roll neck bearing failures. Bearing temperatures couldn't be controlled. A consultant was summoned—Marshall J. Fox, Standard Oil lubrication specialist. His diagnosis and remedy: Install STANOGEAR Compound and equip the machine with a central pressure system for application. Recommendations were followed. Result: No bearing failures, due to faulty lubrication, since. Maintenance costs reduced. Time lost through breakdowns slashed.

This was a condition made to order for STANOGEAR to remedy. And Matthiessen & Hegeler knew there was a man at hand who could suggest what should be done. It's another demonstration of what this unbeatable combination can do when put to work:

1 **Standard Oil lubrication specialists capable of giving technical help.**

2 **Top quality products *that deliver results required.***

STANOGEAR Compounds contain special additives making them suitable for applications where heavy loads cause welding, seizure or scoring.

In the Midwest and Rocky Mountain states, a Standard Oil lubrication specialist in your nearby Standard Oil office will gladly give you more information about STANOGEAR. Call him. Or contact Standard Oil Company, 910 So. Michigan Avenue, Chicago 80, Ill.

STANDARD

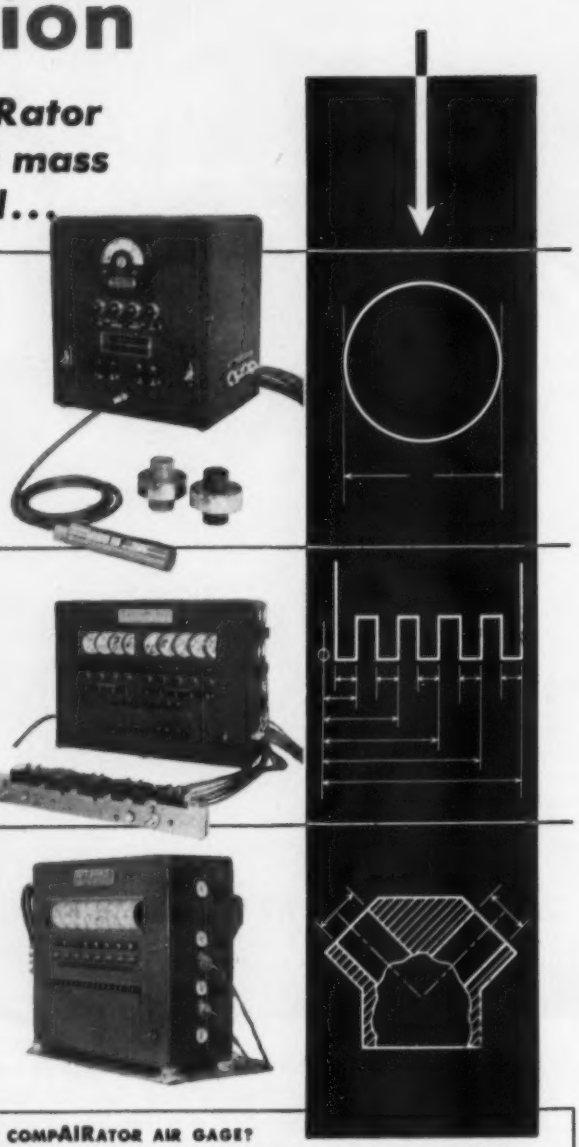
STANDARD OIL COMPANY

(Indiana)

NUMBER FOUR IN A SERIES

Air Gaging for Automation

Some Taft-Peirce CompAIRator Air Gage Installations for mass production quality control...



Size Control on Automatic Lathe

This T-P Air-Electric CompAIRator is attached to an automatic lathe. As parts approach tolerance limits, gaging unit sends an electrical impulse to machine, which advances or retracts cutting tool to keep parts in optimum size range. If a part is produced outside the tolerance limits, unit shuts down the machine.

Size Control at Milling Machine

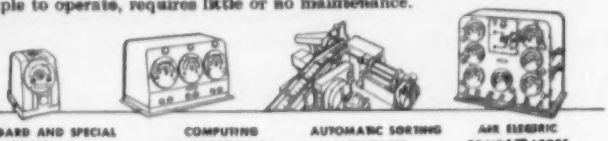
This T-P Air-Electric CompAIRator checks locations and widths of the main bearings of automotive cylinder blocks. 9 dials and lights indicate 5 bearing locations and 4 widths simultaneously. When any location or width is out of tolerance, unit automatically stops milling machine. Light indicates off-size dimension, dial reports exact size.

Size Control in Transfer Machine

This T-P Air-Electric CompAIRator checks 8 cylinder bore diameters simultaneously in V-8 automotive engine blocks. Automatically gages the diameter of the entire length of each bore. If any bore is out of tolerance, a light points it out, and production line is automatically shut down at completion of gaging cycle. Tolerance: .002".

WHAT IS A COMPAIRATOR AIR GAGE?

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.

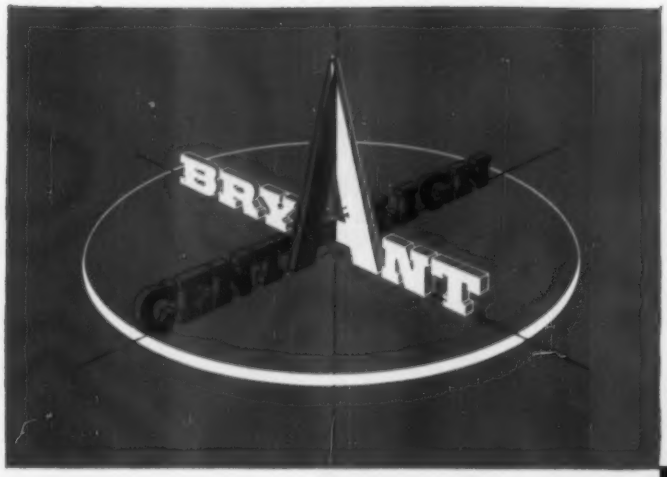


STANDARD AND SPECIAL COMPAIRATORS | COMPUTING COMPAIRATORS | AUTOMATIC SORTING MACHINE | AIR ELECTRIC COMPAIRATORS

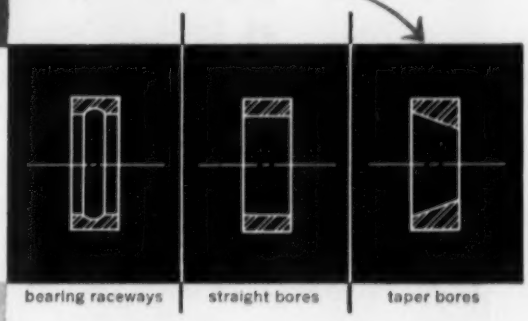
T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND



This taper hole, 2 3/4" dia. X 15/16" long, is ground in just 16 seconds, floor to floor.



Get higher production and lower operating costs with the Bryant "Centalign"

Just 16 seconds, floor to floor, to remove .018 stock to close tolerances. One more proof that the "Centalign" will remove stock up to 50% faster than heavier conventional type machines.

The completely new construction of the "Centalign" offers you unprecedented production rates, continually accurate production, and reduced operating costs because it incorporates such features as **1.** All loads and controlling forces on a common plane, reducing deflection to a minimum and insuring permanent alignment. **2.** Control of machine function by readily interchangeable programming cam units, for quick job change-over and precision machine operation. **3.** Simplified hydraulic servo control system combining the advantages of both cam- and hydraulically-operated machines for accurate machine control and extremely smooth, responsive operation. **4.** Unit-type design, ideal for use in automated lines. **5.** Extremely rigid, stable construction, guaranteeing continually accurate production.

Investigate what the "Centalign" can do for you. Ask for an immediate demonstration.

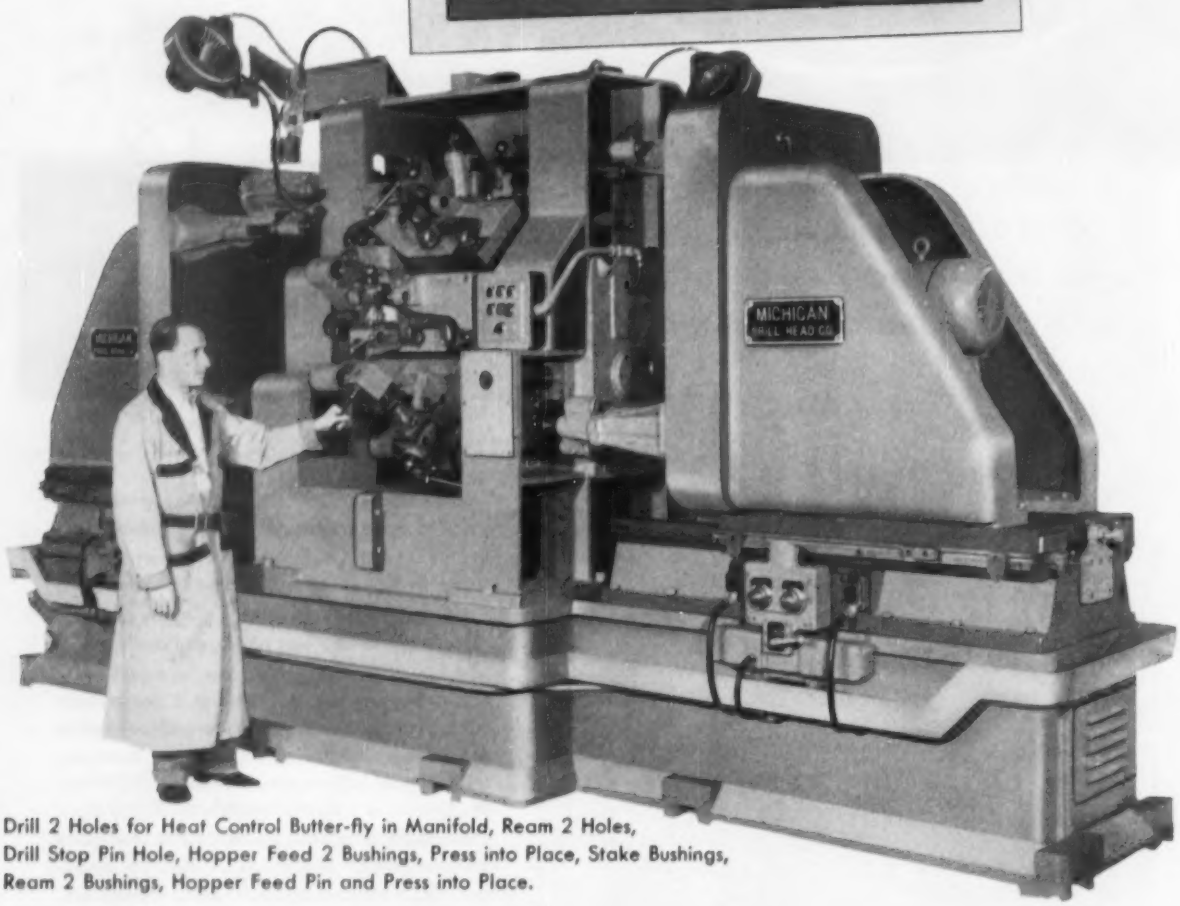
BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

DOUBLE END DRILLING AND ASSEMBLY MACHINE WITH AUTOMATIC INDEX



Drill 2 Holes for Heat Control Butter-fly in Manifold, Ream 2 Holes, Drill Stop Pin Hole, Hopper Feed 2 Bushings, Press into Place, Stake Bushings, Ream 2 Bushings, Hopper Feed Pin and Press into Place.

THIS MACHINE PRODUCES

120 Manifolds per Hour with Bushings and Pin in Place. The Units are Hydraulic with automatically lubricated, Hardened and Ground Ways with Vickers Controls on the Hydraulic Pump and Control Panel.

For Faster, More Economical Production

We also invite your inquiries as to our line of tapping units, and index tables, both manual and automatic.

Michigan DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

ANTISEP the all-purpose water-soluble cutting base

COOL PROFITS--when ANTISEP works for you

Longer tool life, higher quality work, more output per machine . . . all at a cost of 8c per gallon of coolant in the machine! That's the kind of increased profit story that is being repeated in shop after shop where ANTISEP is on the job.

ANTISEP All-Purpose Base gives you everything you want for tough machining jobs. Its extra lubricity insures fast, free cutting on tough metals. Its high film strength and anti-welding properties help prevent chip build-up on tools. Because it is mixed 25 to 1 with water, it keeps tools and work cooler than any straight cutting oil could. You can step up production and still have a smoke-free plant and finer finished work.

Decide today to try ANTISEP. Your Houghton Man will be glad to arrange a test in your plant . . . or write to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

ANTISEP all-purpose cutting base

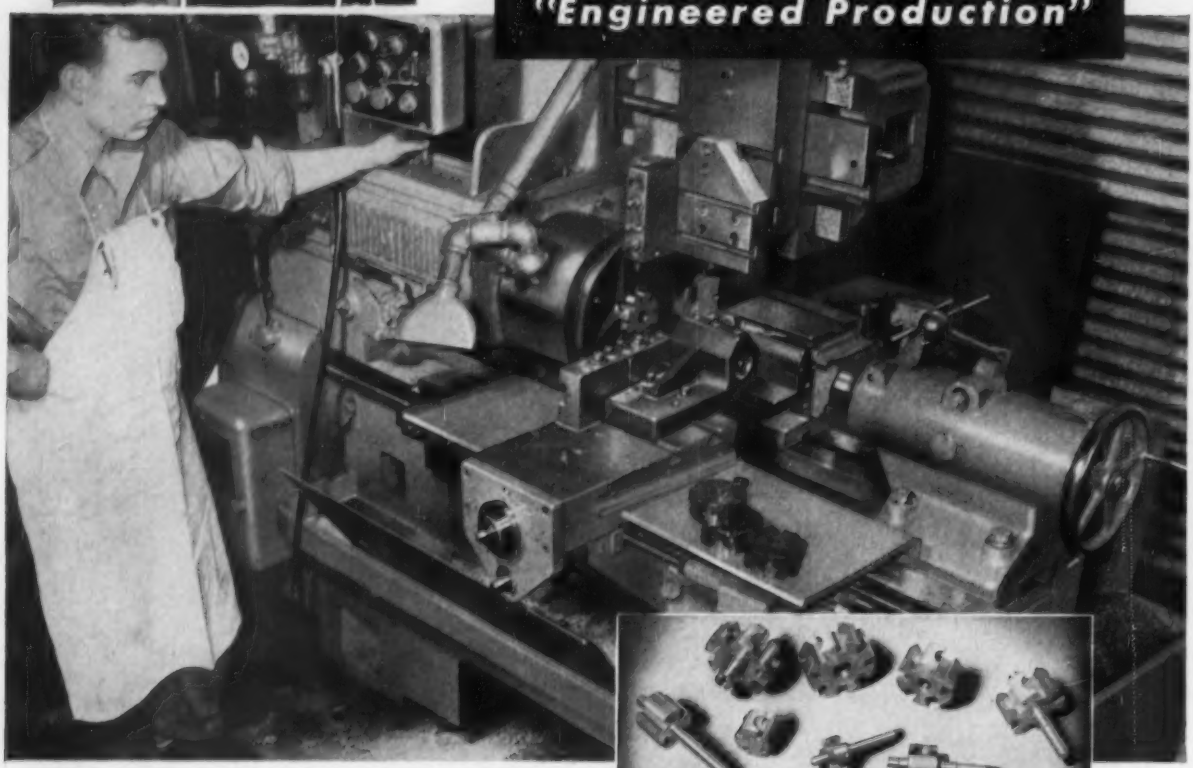
...a product of

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

Before You Buy ANY Turning Equipment Check What You Get From SUNDSTRAND "Engineered Production"

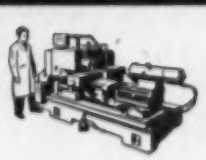


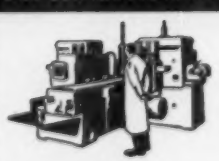
For Instance This Sundstrand Automatic Lathe Increased Production 2½ Times

Here's a small lot turning job done on a Sundstrand Model 8A Automatic Lathe. Pump rotors and covers are turned and faced in lot sizes of 100 to 500 pieces. Previously these parts were run on 3 different conventional turning machines using 3 operations. With this Sundstrand Automatic Lathe, the same amount of work is done 2½ times faster.

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





WHY SUNDSTRAND CAN OFFER ECONOMICAL SOLUTIONS TO PRACTICALLY ANY TURNING JOB

Many years of designing machine features to increase production and lower costs on all classes of turning problems has provided Sundstrand with the experience to design and build equipment for practically any turning job. A few of the diversified types of Sundstrand tooling and equipment provided for different turning problems are shown on this page.

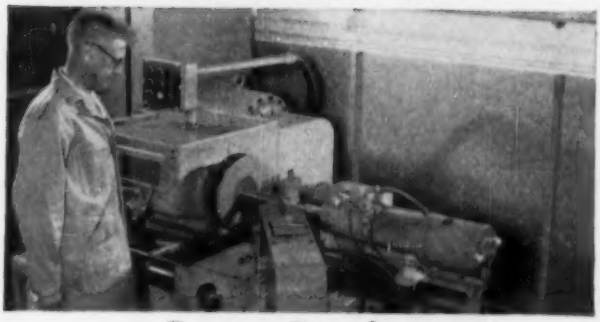
Automatic Tool Resetting

Self compensation for tool wear and automatic replacement of tools worn to a predetermined limit have been built into the Automatic Lathe shown above. Lathe can run approximately an 8 hour shift without attention, except for an occasional check by operator to make sure parts are being delivered to the loading mechanism.

Although the lathe shown above is for turning motor rotors the principle of automatic tool re-setting has been applied to Sundstrand Automatic Lathes for other types of jobs.

How to get the right machine for your work

Investigate the many services and physical equipment available from Sundstrand "Engineered Production." Call in a Sundstrand engineer, or write for bulletin 174. There is no obligation for this service.

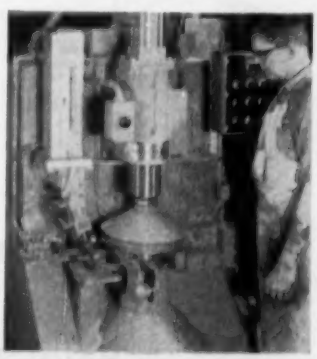


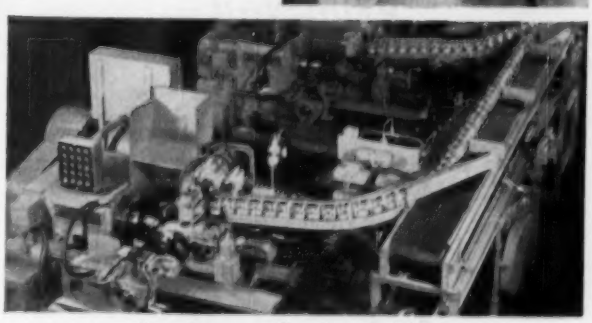
Tracer Turning

For multi-cycle single point turning of irregular shapes, Sundstrand Automatic Lathes can be provided with a template controlled tracing slide that replaces the regular front carriage. With this tracing slide and controls, ruff, semi-finish and finish cuts can be taken with one turning tool in an automatic cycle. The regular rear slide can be used to square up shoulders, chamfer, etc.

Vertical Turning

Here s the Sundstrand Vertical Lathe of a simplified basic design easily adapted to production work. Shown here, it bores, polishes and gages the ID of brake drums. Machine is easily arranged for turning, grooving, or tracer applications.

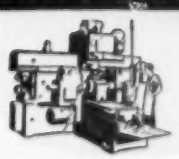


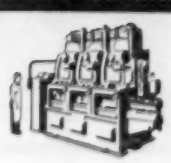


Automatic Loading

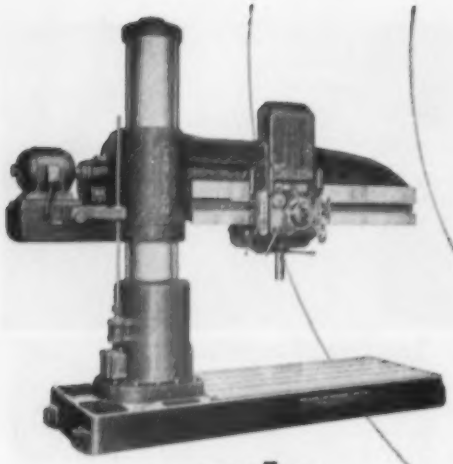
Here's one of the many automatic loading and unloading units designed for Sundstrand Automatic Lathes to handle a specific part. Units of this type simplify machine operation and provide a complete automatic cycle for high production.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.



only

Carlton

radial drills

give you a choice of 3 *speed-feed controls...*

Programming for pre-selecting speeds and feeds for an entire drilling program including as many as 20 or 30 operations. *Pre-selector* for setting speed and feed for the next operation while machine is still under cut. *Manual* to take advantage of Carlton's centralized push button control. For further information, send today for free descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

programming

pre-selector

manual

BRASS keeps sales up... manufacturing costs down

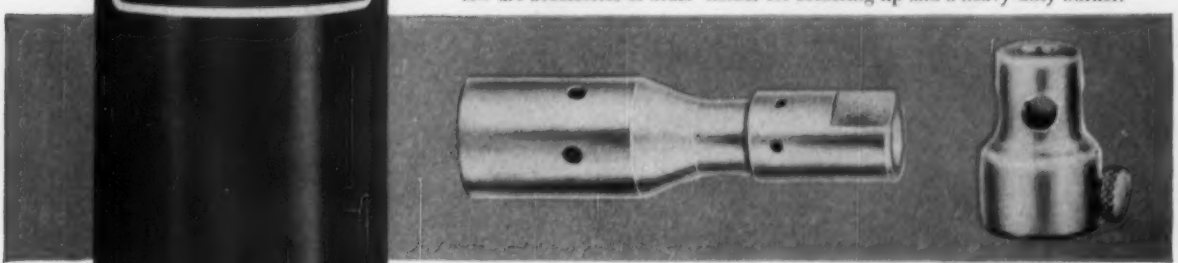
TURNER IS A LONG-TIME USER OF ANACONDA BRASS ROD AND TUBE— GIVES 10 REASONS WHY—

Blow torches built by The Turner Brass Works, Sycamore, Ill., have a reputation for dependable operation and long life. Since 1871, brass has been used consistently in their construction and has built a quality reputation for Turner. Turner prefers Anaconda Brass as a quality metal and looks to The American Brass Company as a quality source of supply.

These are the reasons given:

1. Brass is the quality material needed for the service.
2. Brass is easily machined at high speed, with less tool breakage—manufacturing costs are 15% lower than with other metals.
3. Close tolerances are easily held with brass.
4. Threading holds well—yet accessories are easily screwed on and off.
5. Brass takes a good finish—polishing is easy and economical.
6. Clean, polished brass products have proven high sales appeal.
7. Brass stands up under alternate heating and cooling.
8. Brass resists corrosion—the torches are used on land and sea, throughout the world.
9. Brass gives superior wear on valve seats.
10. Brass has high public acceptance as a quality material.

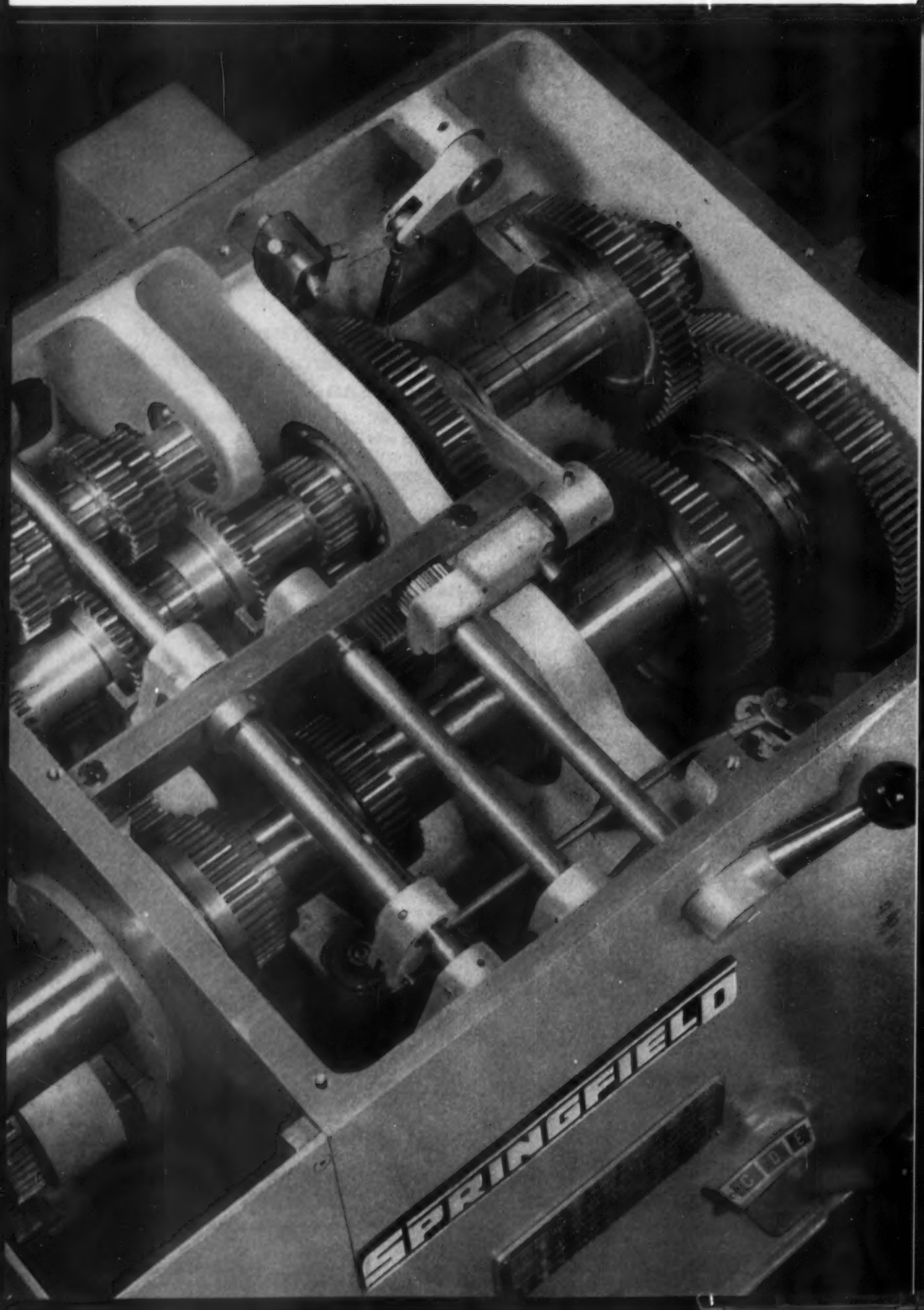
Turner liquefied petroleum torch No. LP-555, with disposable fuel tank. Below are accessories of brass—holder for soldering tip and a heavy-duty burner.

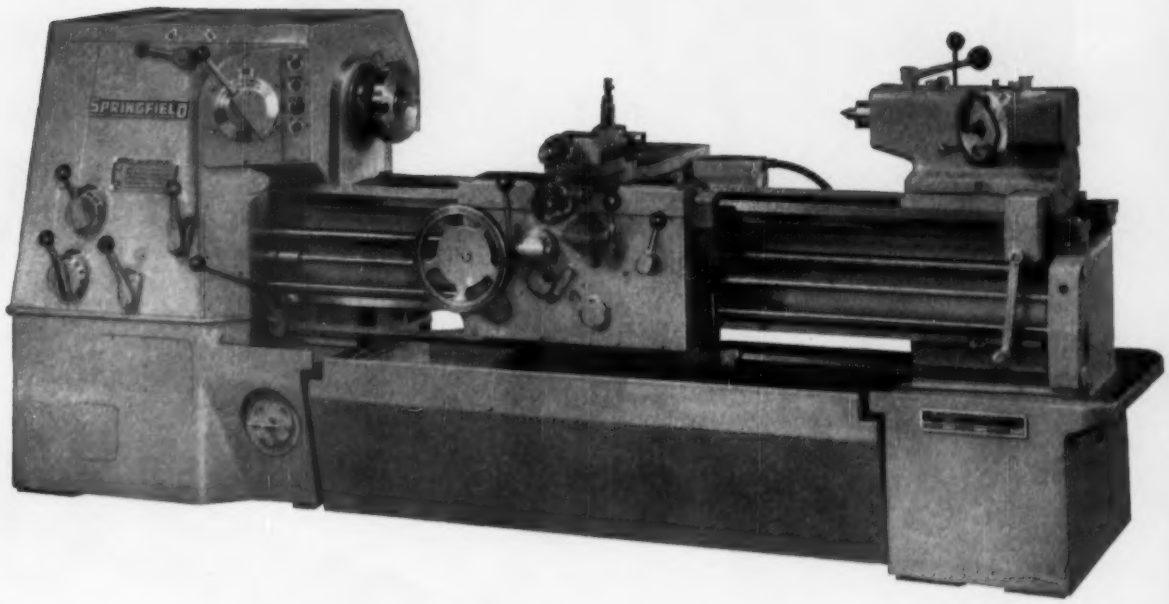


The American Brass Company, Waterbury 20, Conn.
In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA®

COPPER • BRASS • BRONZE


SPRINGFIELD



more useful horsepower

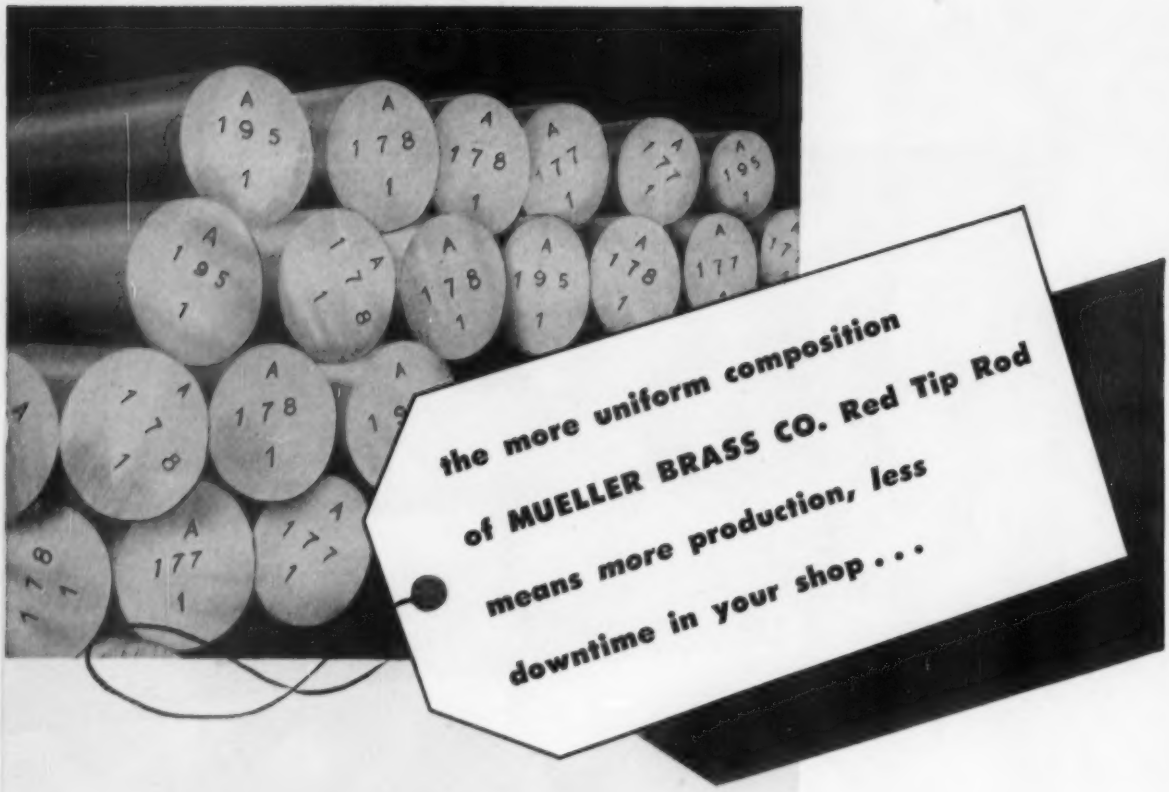
All the horsepower in a Springfield Model "S" Lathe is productive.
A simple, straight-forward gear train, plus double-action lubrication, plus tight dynamic balance tolerances (.0005" displacement) eliminate friction and vibration, the twin horsepower thieves.
In the headstock, only the gears necessary to a given speed are engaged. Other gears run free with a stabilizing flywheel action, no drag on power.
A high pressure filtered oil mist keeps all gears and bearings drenched, and a cascade of oil lubricates the feed box.

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".
Vertical Universal Grinders: swings 18" to 42".

The Springfield Machine Tool Company
Springfield, Ohio

65TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

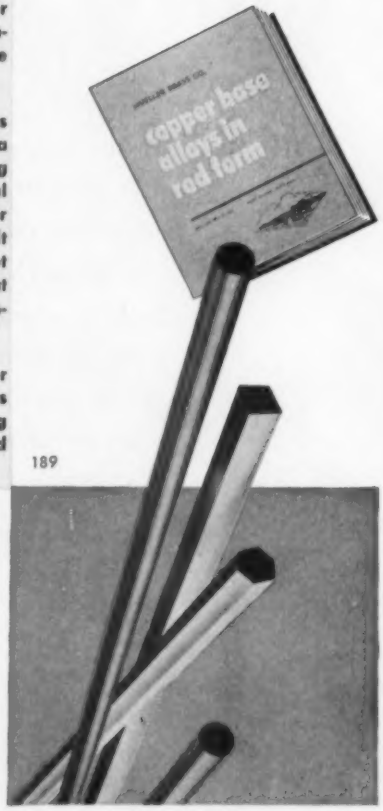
SPRINGFIELD



The new semi-continuous process for casting copper alloy billets at Mueller Brass Co. means that the Red Tip Rod you buy is more uniform than ever before. Production tests have proven that rod made under this new automated process has many advantages for you . . . advantages such as faster machining, increased tool life, less downtime and a finer finished product.

The larger volume of metal being cast as a unit in our new process gives us better control of composition. Laboratory technicians keep a continual check on the melt analysis by means of a direct reading spectrometer which takes only 90 seconds to analyze the alloy. Metal is improved through a new cooling process that results in a greater internal soundness. These and many other advanced techniques result in billets (and therefore rod) which are always the same from one lot to another. All billets are stamped and systematically recorded so that each customer rod order can be extruded from billets of uniform composition.

For the next production run on your automatic screw machines, order Red Tip Brass Rod, and see how our new automated process results in more profitable production for you. Write today for Engineering Manual FM-3010, "Copper Base Alloys in Rod Form", for more detailed information.



189

MUELLER BRASS CO.
PORT HURON 23, MICHIGAN

65TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

courtesy Linden Tool and Manufacturing Co.

Linden's Gilbert holds 235 holes on location ±.0007″

This is the kind of job you can handle profitably if you have a good operator and a Cincinnati Gilbert horizontal boring mill.

The piece is a 50″ by 120″ base for special indexing. Linden Tool and Manufacturing Co., Dayton, O., performs these operations:

1. Mill keyways 9/32″ deep, full length and width of the base. Width of each keyway is 1.000″ ± .001″.

2. Drill 235 indexing holes, .625″ diameter. These holes must be held on location within ± .0007″. In addition, center lines of the holes (horizontal and vertical) must be parallel and square with the key-ways within .001″.

This job is another demonstration of the exceptional rigidity of Gilbert boring mills. Extended table and saddle supports help to maintain accuracy and handle the workpiece. Linden Tool and Manufacturing Company uses two Gilberts to produce a broad range of quality work for its Dayton area customers.

Gilbert boring mills are built as both Table and Floor types, with spindle diameters of 3½″, 3¾″, 4″, and 5″. A selection of column heights, bed lengths, table sizes, and workholding units makes them easily adaptable to your requirements. Add to your work capacity—and your machining dollars—by getting a proposal from Gilbert now.

The Cincinnati Gilbert Machine Tool Co.
3340 Beekman Street, Cincinnati 23, Ohio

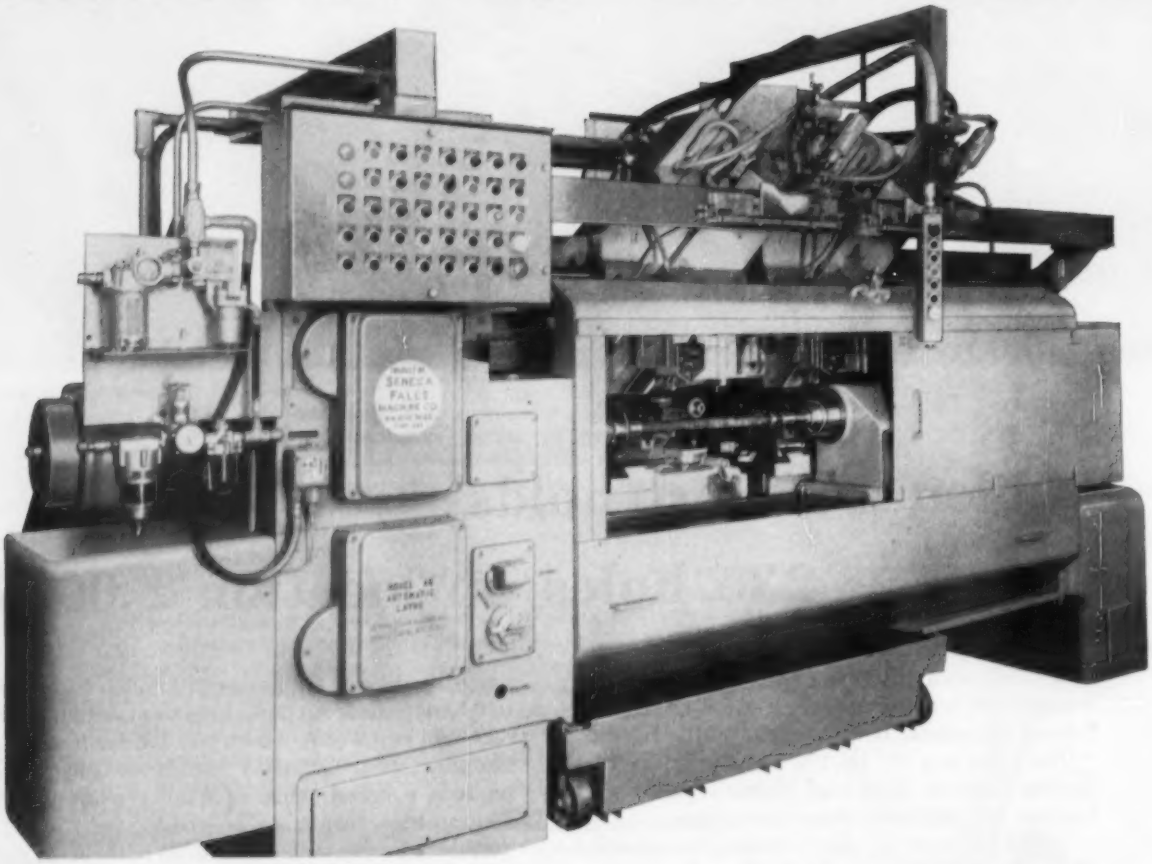
Low-cost financing plan—6% simple interest (3% add on), up to 5 years to pay—makes your purchase of Gilbert equipment immediately feasible. Subject to change.

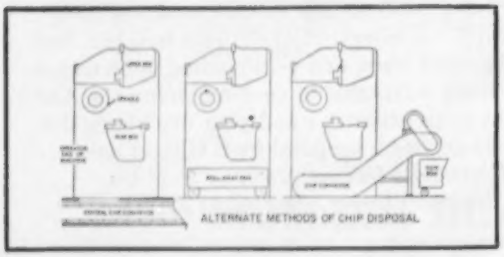
those who buy Gilbert buy **GILBERT** *again*

MACHINE OF

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK

A BETTER METHOD OF MACHINING REAR AXLE, AND OTHER SHAFTS



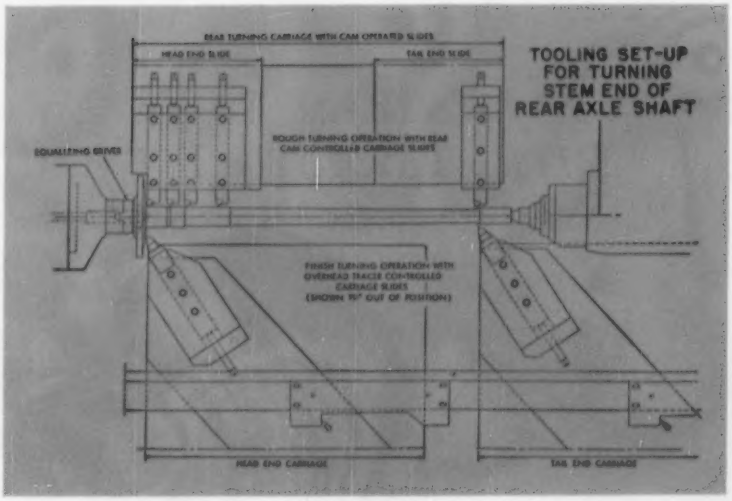


ALTERNATE METHODS OF CHIP DISPOSAL

SENECA FALLS
MODEL AQ AUTOMATIC
LATHE, 60 H. P.
NET WT. 25,000 LBS.
ALSO
MODEL LQ. 30 H. P.
NET WT. 20,000 LBS.

NEW SENECA FALLS

THE MONTH



● The new Models LQ and AQ Seneca Falls Automatic Lathes are designed to combine the best and fastest methods of rough and finish turning shafts on a single machine without removing the work and without attention on the operator's part.

The roughing operation is accomplished with multiple tools on a rear carriage while finish turning is done with single, tracer-controlled tools on each of the two overarm carriages. Thus the advantages of multiple tooling for stock removal and single tool tracer turning for accurate finish operations are combined. By this method extremely close tolerances are maintained since the pressure of the single tool is constant over the entire length of the work piece, and full advantage can be taken of the higher cutting speeds now possible with the newer carbide and oxide tool materials.

The machining operation is completely automatic...the operator loads shafts between centers and pushes the starting button; multiple tools rough turn; tracer tools then finish turn; and finally the machine stops with all tools returned to starting position.

A similar type lathe is used for the flange turning operation. Varying application of multiple tooling or single tracers to either rear or overarm carriages is possible on these lathes and complete "in line" automation can be engineered to specific production requirements.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

WRITE FOR BULLETIN Q-56-A

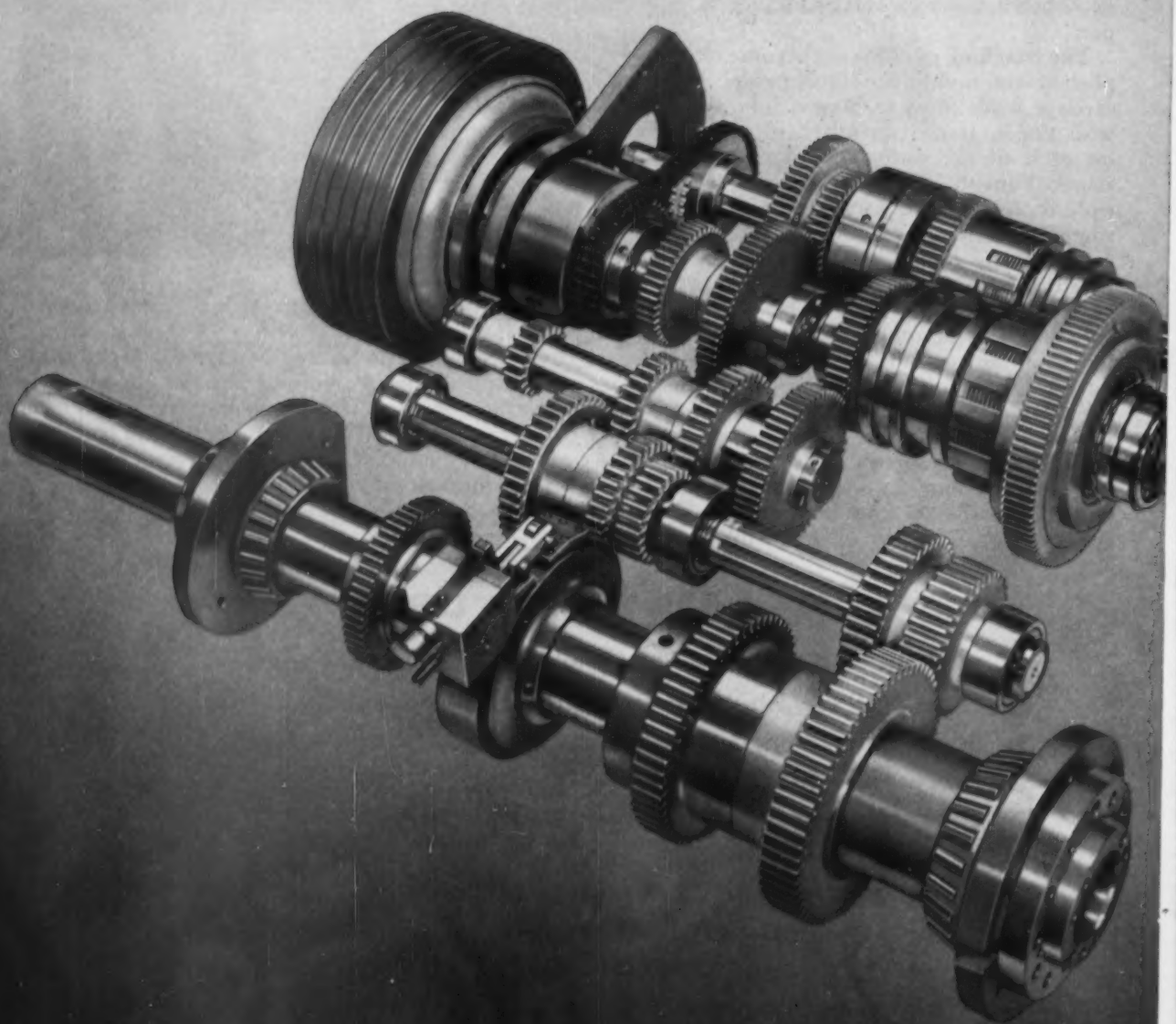
DESIGN FEATURES

- ▶ **Simplified changeover features for reduced set-up time.**
- ▶ **Feed rate may be automatically changed during cutting cycle.**
- ▶ **Streamline design for efficient chip guarding.**
- ▶ **Screw feed to all carriages.**
- ▶ **Four speed head with automatic change-over.**
- ▶ **Large chip flow area.**
- ▶ **All templates clear of chip area.**
- ▶ **All ways hardened, ground and replaceable.**
- ▶ **Open front design facilitates loading and unloading.**
- ▶ **Straight line diameter adjustment for tracer tools...no shoulder length change to correct.**

MODEL LQ AND AQ AUTOMATIC LATHES

The **power reserve** *and* **range of speeds**

YOU'LL NEED FOR THE



TOOLS OF TOMORROW

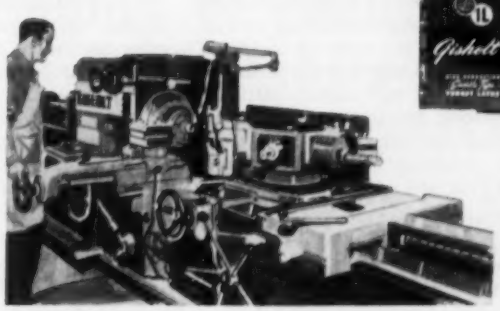
New GISHOLT MASTERLINE SADDLE TYPE TURRET LATHE

WANT MAXIMUM OUTPUT AND ACCURACY from today's carbide tools—with an ample reserve of power and speeds to meet tomorrow's tooling requirements?

That's what you'll get—*now*—from this powerful, rugged Gisholt MASTERLINE Saddle Type Turret Lathe. Prime example of this machine's advanced features is the rugged Headstock Gear Train, shown at the left. Here, you can get 24 different forward speeds—all from a *single*-speed motor. This means you get *full* power *all* the time—a critically important feature for those heavy cuts at punishing feeds.

But that's not all. To give you maximum performance from this powerful gear train, Gisholt designers have backed it with faster speed changes through the Hydraulic Speed Selector (effortless speed shifts without waiting or computing); a hydraulically operated Hi-Lo speed change in a 6:1 ratio (without stopping the spindle or shifting gears); and a new Self-Adjusting Electric Clutch and Brake (smooth, fast starting and stopping, plus more accurate inching of the spindle).

Ask your Gisholt Representative to give you the complete facts. Why not call him today?



ASK FOR complete set of Gisholt MASTERLINE Saddle Type Turret Lathe Bulletins.

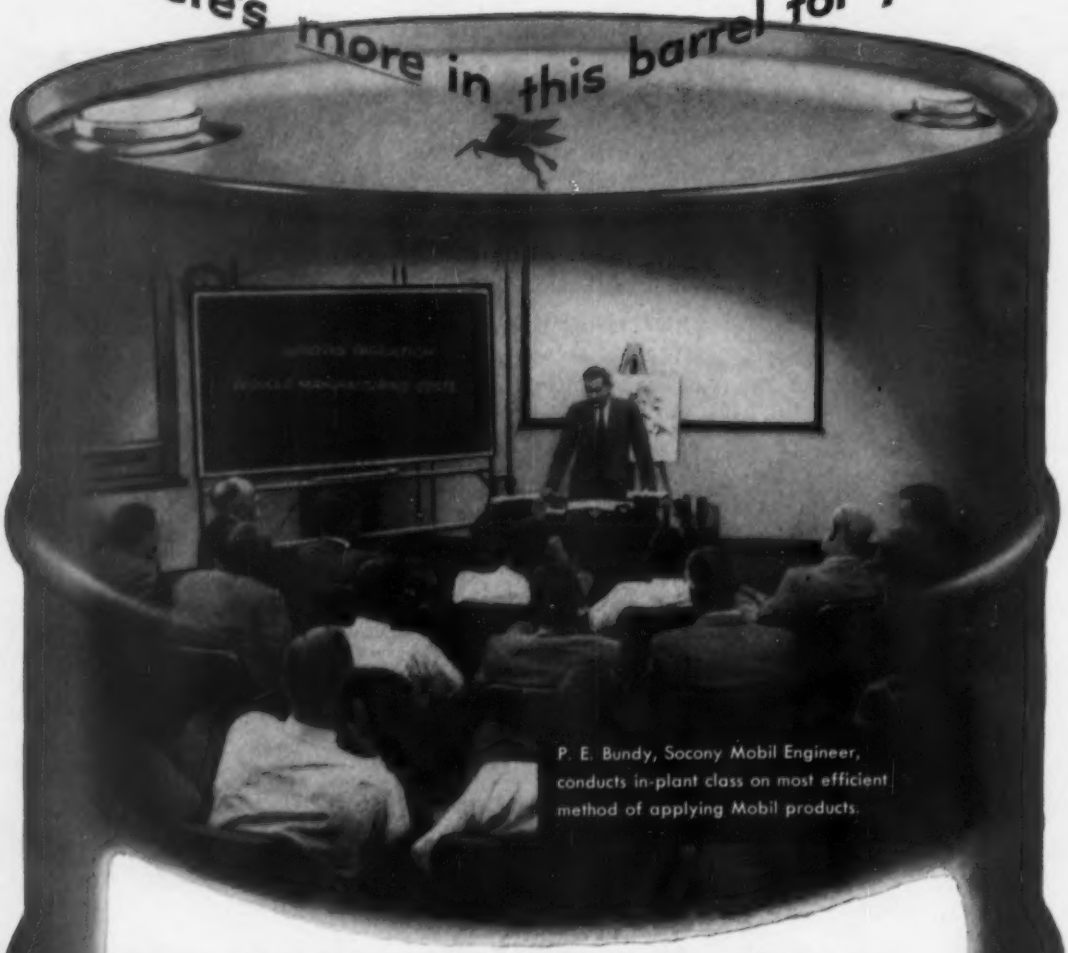
GISHOLT MACHINE COMPANY

MASTERLINE GISHOLT SINCE 1887

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

There's more in this barrel for you...



P. E. Bundy, Socony Mobil Engineer, conducts in-plant class on most efficient method of applying Mobil products.

MORE IN-PLANT TRAINING

to help you improve production and cut costs!

With Socony Mobil petroleum products we offer you more in-plant training courses and seminars than any other oil company. Lubrication experts instruct your personnel in the most efficient, most economical methods of applying and using our products. This thorough training eliminates over-use and waste—helps improve your production and lower your unit costs.

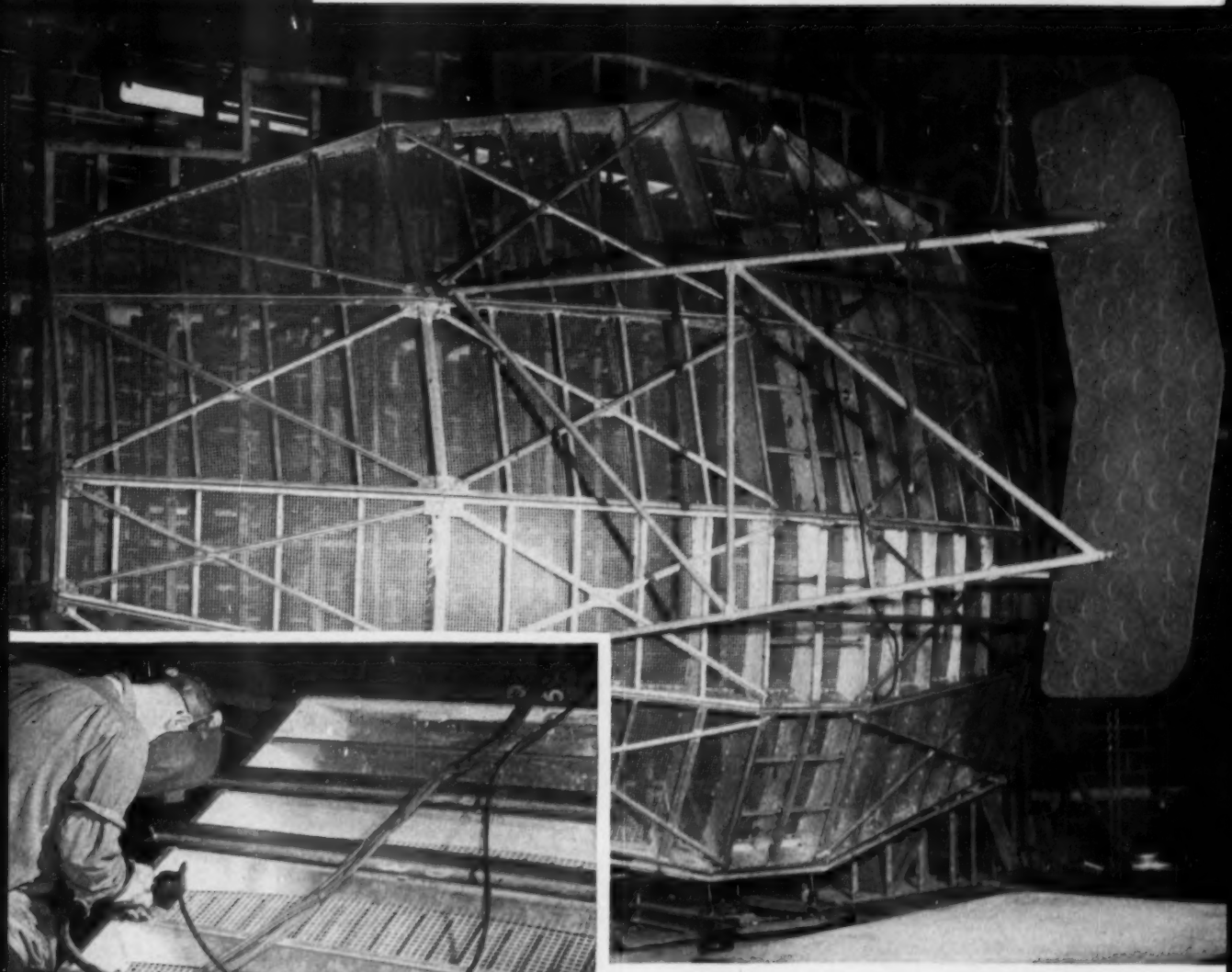
Socony Mobil products are also backed by *more* field engineers serving industry . . . *more* continuous research to assure continually improved products . . . *more* services for analyzing petroleum products in use . . . *more* approvals from machine builders . . . *more* practical experience—90 years!

Always specify Socony Mobil. There's *more* in every barrel for you!

SPECIFY **SOCONY MOBIL** FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

LUBRICANTS • FUELS • CUTTING FLUIDS • WAXES • SOLVENTS • PLASTICIZERS • PETROCHEMICALS



Completed aluminum radar antenna (above) stands more than 20 feet high at the Garden City, Long Island, plant of General Bronze Corporation. At left, a welding operator uses General Electric Fillerarc* equipment to weld $\frac{3}{32}$" diameter aluminum screen to an antenna section frame—a tough welding job because all welds must be sound enough to support the weight of the antenna under constant buffeting from the wind.

Fillerarc* welding of radar antennae is 10 times faster, costs 25% less

Fabricating giant, aluminum radar antennae can be a costly and time-consuming operation. But General Bronze Corporation of Garden City, N. Y., has found that compared with the tungsten-arc method formerly used, it can speed such welding 10 times while cutting costs 25 per cent with General Electric Fillerarc gas-shielded, consumable-electrode equipment.

Requirements for welding the antennae are demanding. Each antenna is composed of sections of varied size and shape, which must be assembled to form the completed unit. Materials used range from $\frac{1}{8}$" aluminum frame to $\frac{1}{16}$" cross channels and $\frac{3}{32}$" diameter aluminum screen.

*Registered trademark of the General Electric Co.

Preliminary tests using semi-automatic Fillerarc equipment resulted in strong, smooth welds, and the trouble and expense of cleaning up flux was eliminated. So, General Bronze now uses Fillerarc welding equipment on all its antenna work and is looking for other jobs Fillerarc can do faster and at less cost.

And, Fillerarc is versatile. It can weld mild and stainless steel, bronze, nickel, and magnesium. For more information on how Fillerarc can save you time and money, call your nearby General Electric welding distributor (see the yellow pages of your phone book), or write for bulletins GEC-989 and GEC-1334 to Section 713-6, General Electric Co., Schenectady, N. Y.

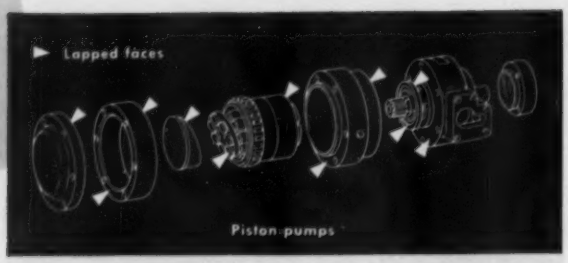
Progress Is Our Most Important Product

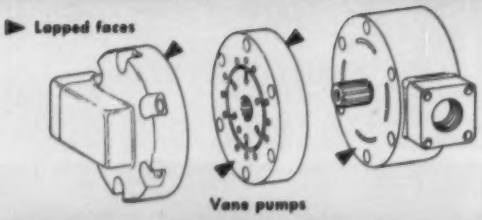
GENERAL ELECTRIC

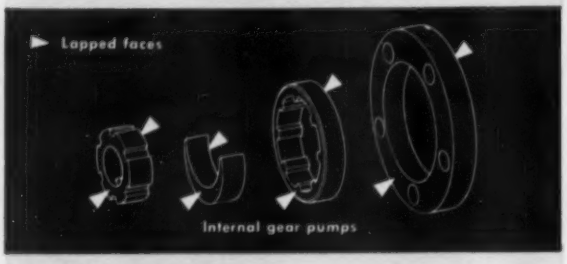
How Pump Manufacturers Use the Lapmaster® To Improve Product Performance

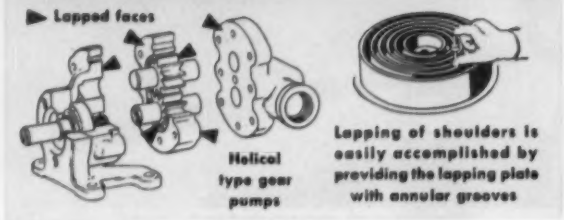
Like valve manufacturers, a large number of pump manufacturers need precision flatness and finish in order to insure efficient product performance. They're getting *both* flatness and finish plus parallelity in production quantities with Lapmasters. Photos at right illustrate a few typical parts being machined daily.

The high production accuracy of the Lapmaster (micro-inch finishes of 2 to 3 RMS—surface flatness to less than .000011" when required) is being achieved on all materials including cast iron, steel, stainless steel, magnesium, aluminum, brass, carbon, ceramics, plastics and sintered metals. It will pay you to investigate this modern precision, yet economical, method of machining.







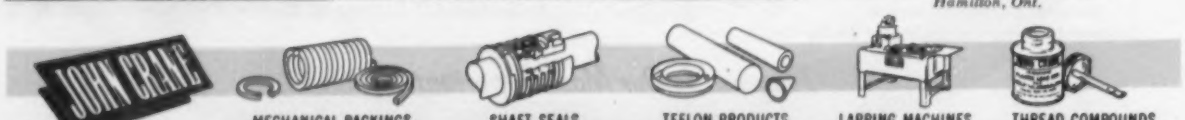

Lapped faces
Helical type gear pumps
Lapping of shoulders is easily accomplished by providing the lapping plate with annular grooves

*Protected by U.S. and Foreign Patents

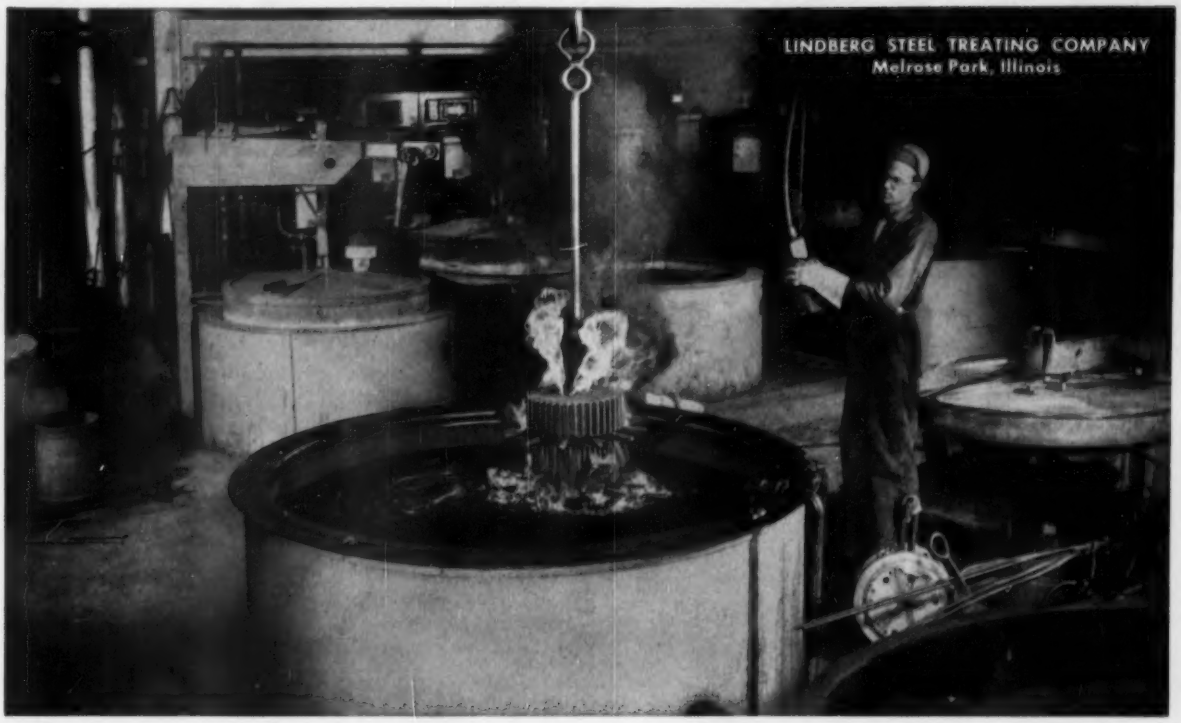
FREE TECHNICAL DATA

These three booklets will give you the facts on producing and measuring precision flatness and finish. Write for your copies today.

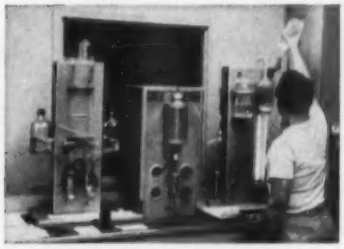
Crane Packing Company
4436 Oakton St., Morton Grove, Ill.
(Chicago Suburb)
In Canada: Crane Packing Co., Ltd., Hamilton, Ont.



CRANE PACKING COMPANY



For machine shop tolerances— Lindberg uses Cities Service Quenching Oil



Lindberg's Lab stringently tests treated metals. Dimensional changes from poor quenching oil would quickly show up here. But Cities Service Quenching Oil cools metal with no significant dimensional change.

Some of Lindberg's Furnaces. Here, they heat-treat all kinds of steel products . . . bolts, washers, gear blanks, saw blade segments, etc. Steel for bars of Illinois State Penitentiary was one of their first jobs.

At Lindberg Steel Treating Company a routine order might include a dozen shafts, stamping and forming dies, jigs and fixtures and even production parts. But though the products might differ, most would carry the same stipulation—heat treat with very low dimensional change.

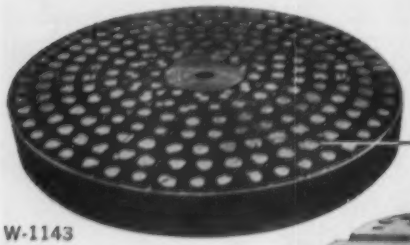
To some heat treating operations this might present a problem, but not to Lindberg. By the use of Cities Service Quenching Oil, they're able to cool their steel with no significant changes in dimension.

"In addition," say Lindberg metallurgists, "we like Cities Service Quenching Oil because it has high flash point, consistent viscosity, excellent oxidation resistance, and a stable cooling rate."

Anyone looking for a better quenching oil would do well to try this superior Cities Service oil. For further information, talk with your local Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

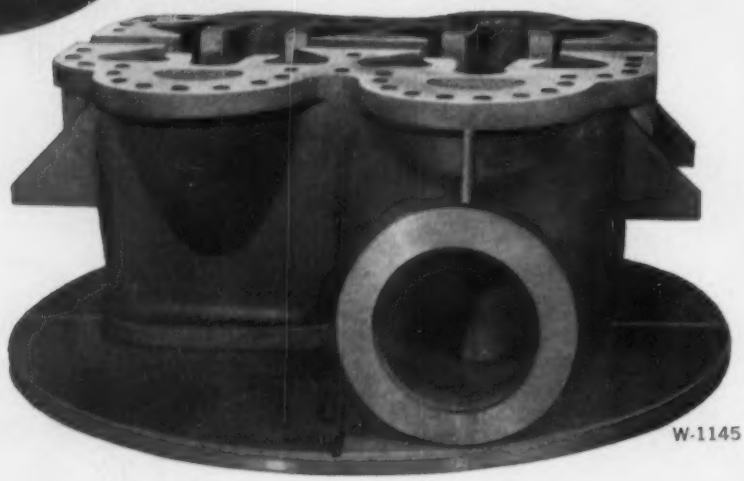
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



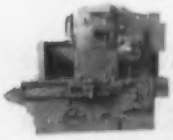
W-1143

tiny or **tremendous...**

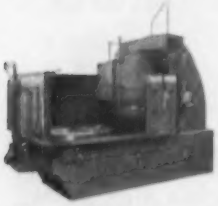


W-1145

For best results...***PUT IT ON A BLANCHARD!***



Blanchard No. 18



Blanchard No. 42-84

There's a Blanchard for every surface grinding job, in a broad range of sizes. For example, the Blanchard No. 18 grinds non-magnetic transistor elements (upper left) .006" thick, to a tolerance of .0005" with good finish. This job, which involved .006" to .008" stock removal per side, was held on special fixture plates.

At the other end of the scale, a huge Blanchard No. 42-84 Grinder grinds a turbine housing (upper right) which measures 83" across the corners, and is 28" high. This housing, ground after rough machining, required .020" stock removal. Both this piece and its mating part were ground to a steam-tight joint.

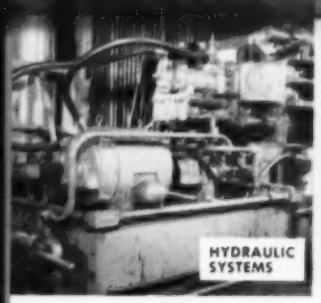
Whatever *you're* grinding—be it tiny watch parts, giant steel plates, or anything in between—there's a Blanchard designed to do the job speedily and accurately.

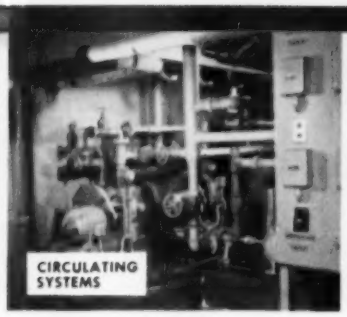
Ask for details on the 15 standard Blanchard models.

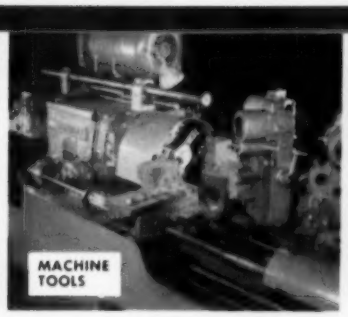
PUT IT ON THE BLANCHARD

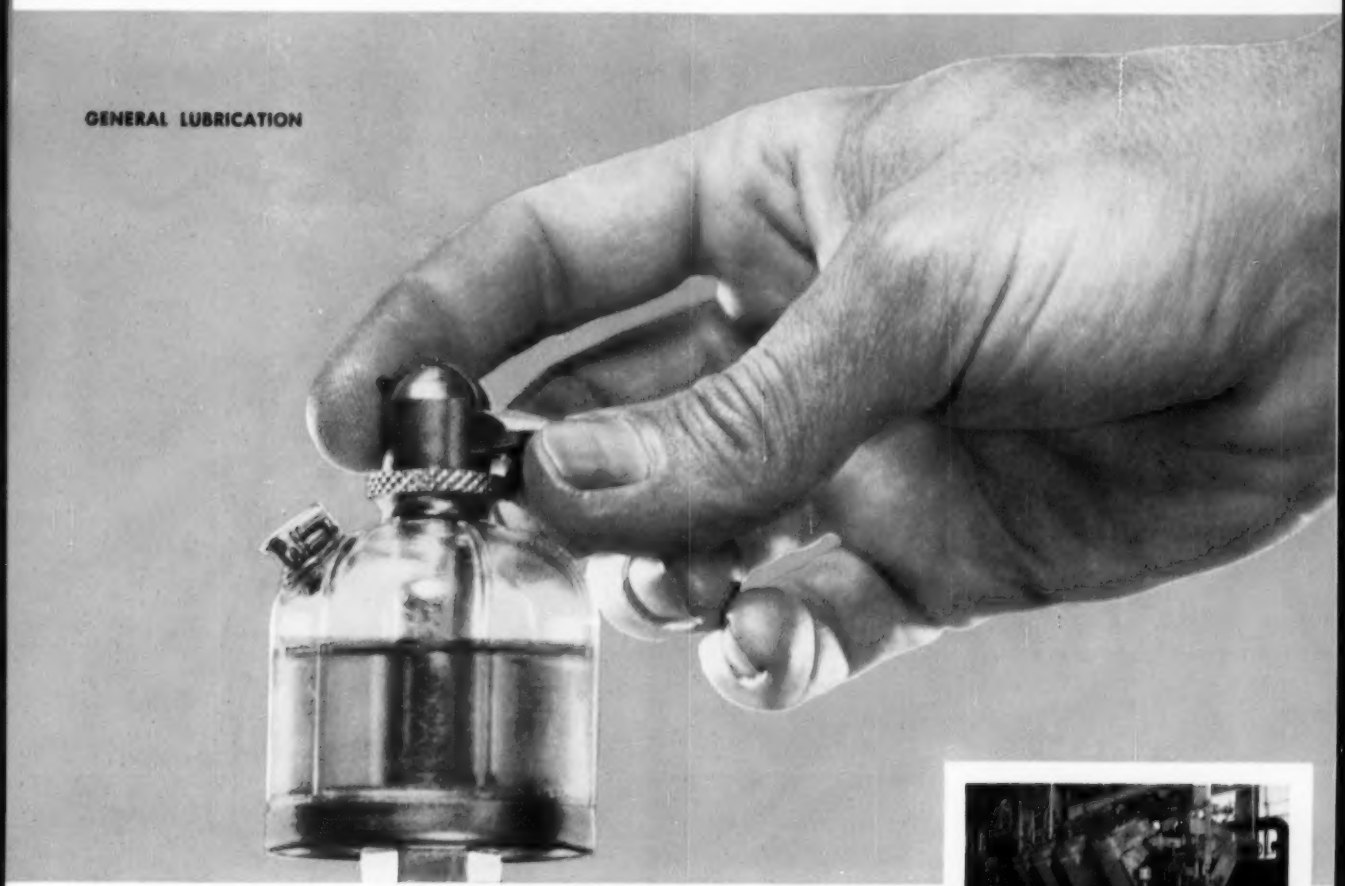
Send for free copies of "Work done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.





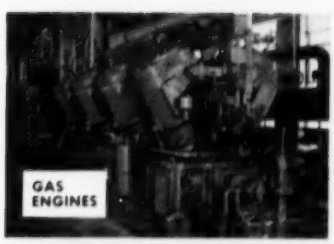


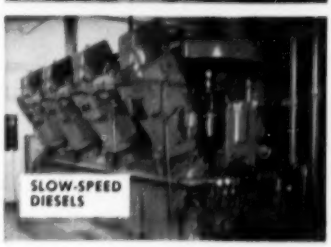


SUN SOLNUS OILS IDEAL LUBRICANTS FOR 80% OF ALL APPLICATIONS

Moderately priced...low in carbon-forming tendencies, Sun Solnus® oils simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several.* Their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price all add up to "more lubrication per dollar."

For technical information, see your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-51.





SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

PHILADELPHIA 3, PA.

© SUN OIL CO.

In Canada: SUN OIL COMPANY LIMITED, Toronto and Montreal

Valve on left is from compressor run for 3,000 hours with well-known, high-grade oil. At right is same valve after a 3,000-hour run with Sun Solnus oil. Note difference in carbon deposits.

3000-HOUR TEST PROVES SUN SOLNUS OILS REDUCE CARBON BUILD-UP IN COMPRESSORS

Equipment: A three-stage Norwalk horizontal-type compressor. Operating pressure: from 1,000 to 1,500 psi.

Test: The compressor was cleaned thoroughly and filled with a well-known, high-grade oil. The equipment was run for 3,000 hours, then torn down for inspection and cleaning. Then Solnus® 300 was tested in the same way.

Results: Look at the two pictures. You can see for yourself how Solnus oil reduced dangerous carbon build-up.

All types of reciprocating air compressors that have been changed over to a Sun Solnus oil show similar results. A test in your compressor will show the same remarkable reduction of carbon deposits.

You can get a technical bulletin about Sun Solnus oils by asking your Sun representative, or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-52.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

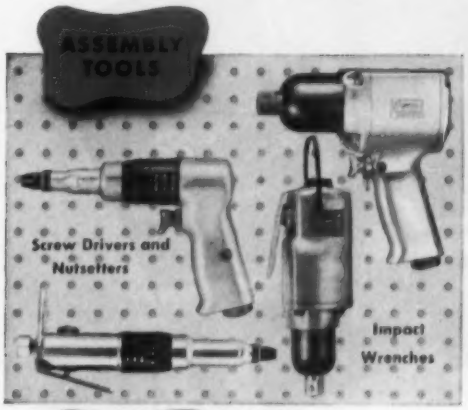
SUN OIL COMPANY PHILADELPHIA 3, PA.

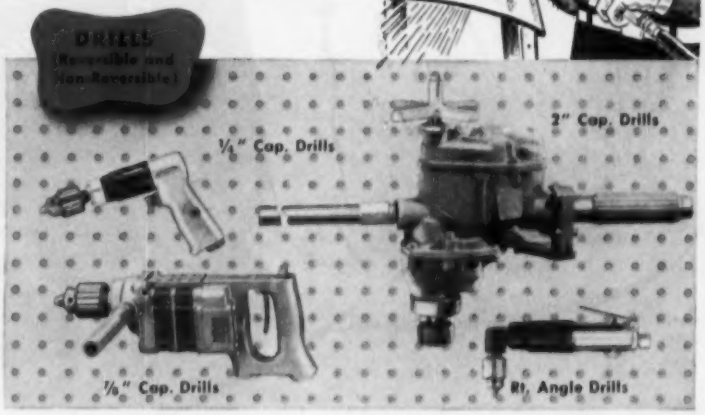
© SUN OIL CO.

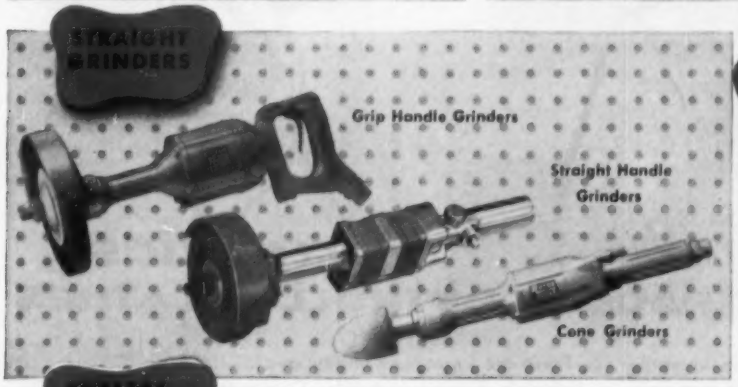
IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

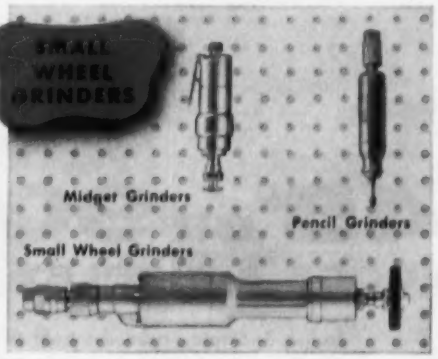
What's your portable tool problem?

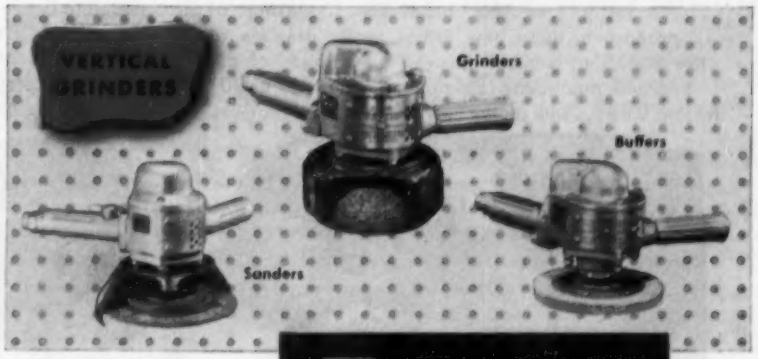
THERE'S A POWERFUL ROTOR TOOL TO DO IT *FASTER!*











● Write for Bulletin 53 giving specifications on complete line of Rotor Tools for all industry. The ROTOR TOOL Company, Cleveland 32, Ohio.

ROTOR TOOLS
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

45° OR 90° *Powerturn* COPYMATICS

LODGE & SHIPLEY TRACER CONTROLLED LATHES

Lodge & Shipley produces both these versatile duplicating lathes! Now, choose the type that perfectly suits your production. Speaking of production, these new lathes really produce at low cost. They combine proven advantages of all-hydraulic duplication . . . featuring either 45° or 90° tracing slide . . . with all the new POWERTURN features.

There are 5 new sizes and types of COPYMATICS suitable for your needs. Complete details are available in two new pieces of literature: Bulletin 309, 90° COPYMATIC and Bulletin 310, 45° COPYMATIC. For your copies, address: The Lodge & Shipley Company, 3055 Colerain Ave., Cincinnati 25, Ohio.

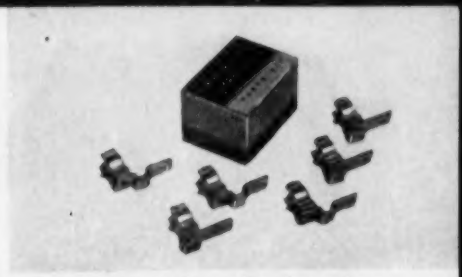
45° COPYMATIC
. . . offers contour facing as well as turning and boring . . . particularly suited for turning contours involving diameters connected to faces by curves!

90° COPYMATIC
. . . traces in both directions: toward head or tail . . . faces exactly square shoulders . . . maximum versatility and tracing capacity!

more than ever before . . . your LODGE-*ical choice is* **Lodge & Shipley**

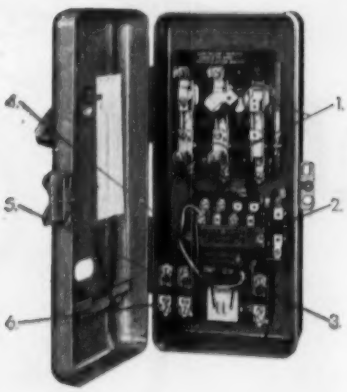
How you profit by using . . .

6 KITS TO MODIFY GENERAL ELECTRIC MAGNETIC STARTERS

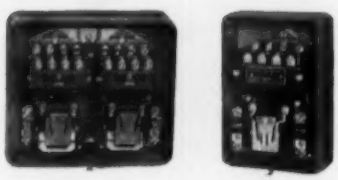


1. FUSE CLIPS can be easily changed on all G-E combination starters for use with different line current ratings or voltages.

2. AUXILIARY INTERLOCKS can add up to four additional control circuits to provide maximum flexibility for magnetic starters.



4. SELECTOR SWITCH fits into same cover knockout as the pushbutton unit, and gives you a choice of ON, OFF, or AUTO. setting.



3. PUSH BUTTON for START-STOP operation can be mounted through knockout provided in the cover of G-E magnetic starters.

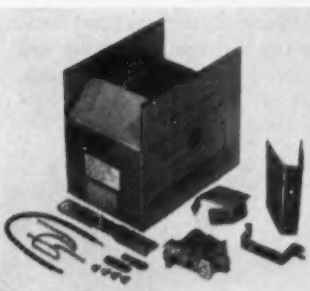
5. STRONGBOX COIL can be changed quickly and easily for different voltage ratings. There is no need to disturb power wiring.

KITS PERMIT ON-THE-SPOT MODIFICATION OF G-E STARTERS

These six modification kits modify any G-E across-the-line non-reversing, combination, or reversing starter. This means that your distributor can give you off-the-shelf delivery of all these forms.

If you now stock modified starters, these kits—plus standard starters—will permit you to cut inventories of "specials" and still have the starters you need. All modifications can be made quickly, and a screwdriver is the only tool needed.

Send in the coupon below for a new bulletin, complete with ordering data and "how-to-do-it" pictures of each kit. Your nearest General Electric Distributor will be glad to give you additional information.



6. 3RD OVERLOAD RELAY can be added, whenever needed, to G-E magnetic starters. A screwdriver is the only tool necessary.

Advertising and Sales Promotion Section J733-17
General Electric Company
Bloomington, Illinois

Please send me a free copy of MODIFICATION KITS FOR MAGNETIC STARTERS GEA-6481

NAME.....

COMPANY.....

ADDRESS.....

CITY..... **STATE**.....

GENERAL ELECTRIC

LAY THAT PISTOL DOWN PAL

There's an easier way out of your bearing troubles

Russian roulette may seem to be the easiest and quickest way out when bearings start to go and production starts to stop. But quicker still is a replacement from an authorized **SKF** distributor. He's the man to see for *all* types of anti-friction bearings and pillow blocks, and he's the man who will give you prompt service 24 hours a day. This factory trained specialist is ready to help you select the right bearing for the job. His broad experience in solving problems of maintenance means proper guidance in protecting your bearings for longer life. Doing business with the right distributor—the **SKF** distributor—is good business and good assurance of getting the bearings you need when you need them.

7746

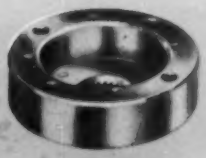
SKF

EVERY TYPE—EVERY USE

- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings* ("Tyson")

• Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

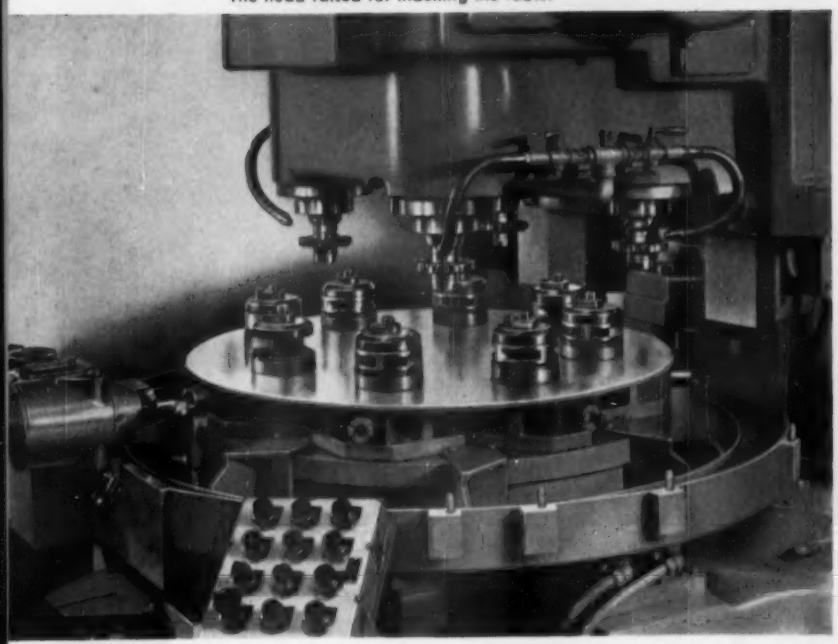


80 PARTS PER HOUR

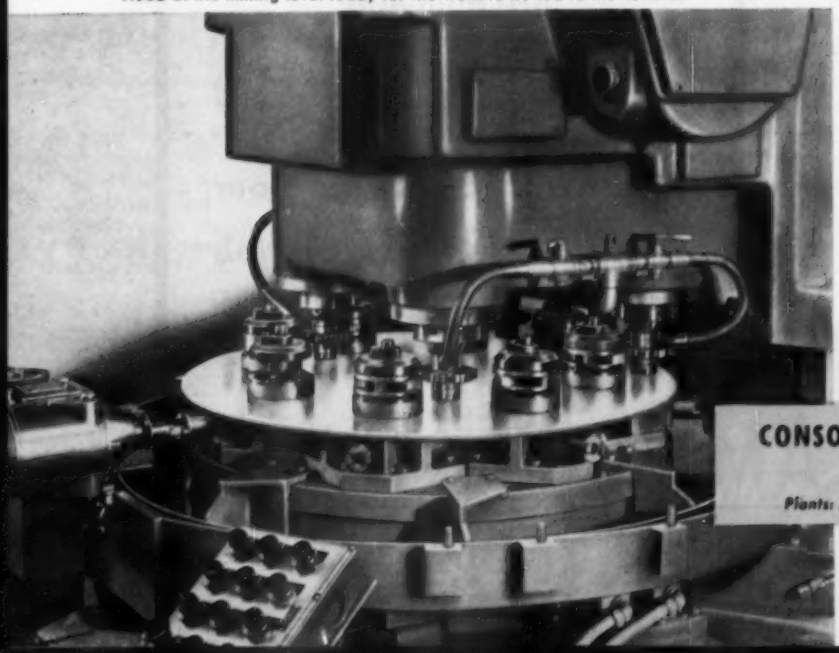
AUTOMATICALLY INDEX-MILLED

on a Newton vertical rotary

The head raised for indexing the table.



Head at the milling level ready for the work to be fed to the cutters.



On the job at a leading automotive plant, the Newton vertical rotary in the photos turns out eighty finished parts per hour. All movements are hydraulic, and each index produces a finished piece—milled on four sides.

The cycle is as follows: (1) the head raises and the table indexes to a precision-locked position, (2) the head lowers to the milling level, (3) the table traverses and feeds in a straight line to the cutters and the work is milled to depth, (4) the table backs away in fast traverse and the head raises, (5) the table revolves for the start of the next automatic cycle.

The Newton vertical rotary has been designed to save time and energy in every phase of the operating cycle. For index milling, an NVR adds up to a substantial increase in production efficiency.

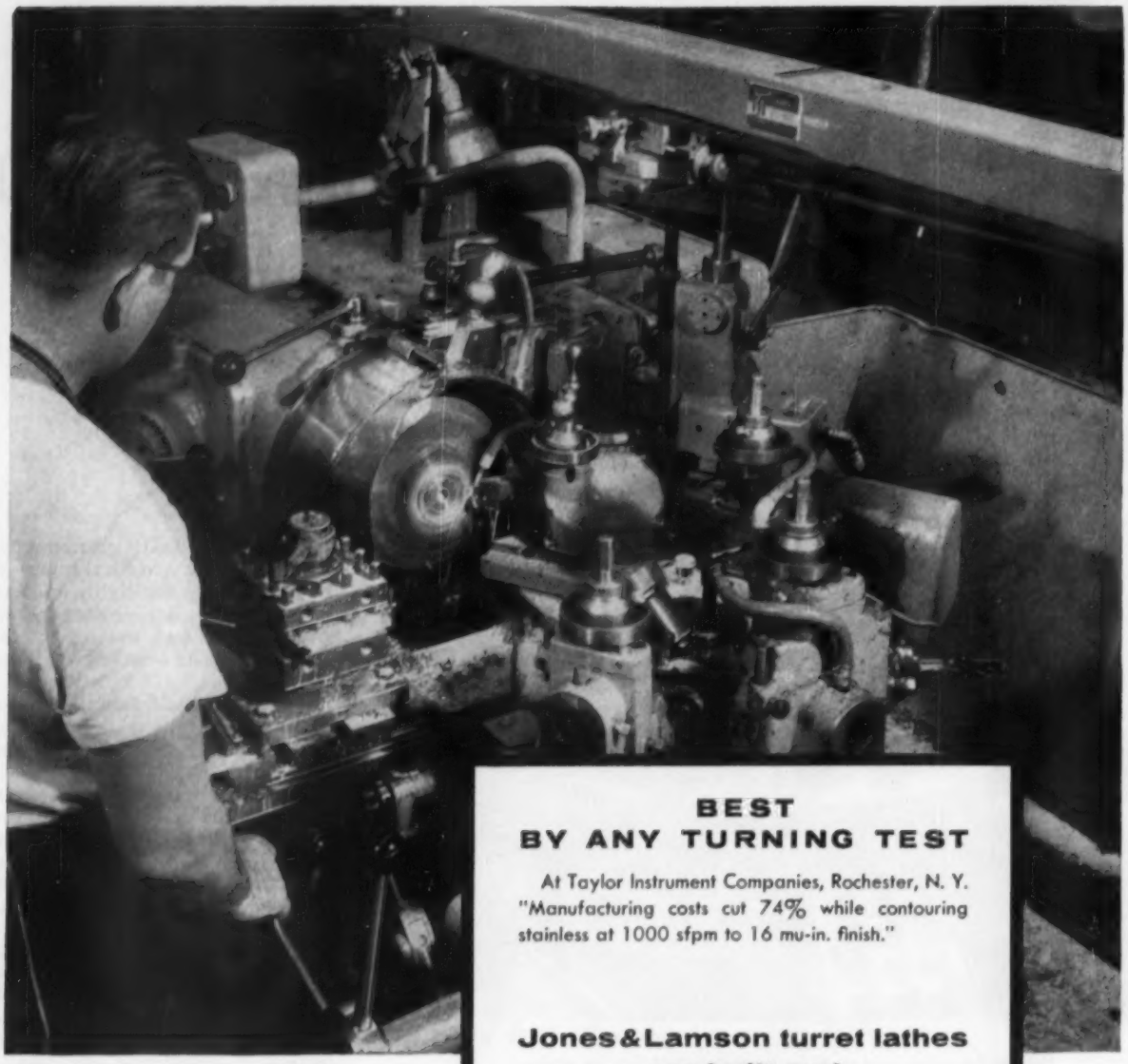
For more about Newton vertical rotaries, ask for bulletin 651.

CONSOLIDATED MACHINE TOOLS

Engine Lathes
Vertical Boring and Turning Mills
Floor and Planer-Type Horizontals
Planers, Double Housing and Openside
Planer-Type Milling Machines
Plate Edge Planers
Vertical Slotters
Rotary and Straight-Line, Production-Type Milling Machines
Skin Mills for Aircraft Manufacturing
Circular Cold Saws
Railroad Wheel and Axle Machinery
Special Machine Tools

CONSOLIDATED MACHINE TOOL DIVISION
FARREL-BIRMINGHAM COMPANY, INC.
Rochester 10, New York
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

CM-13



BEST
BY ANY TURNING TEST

At Taylor Instrument Companies, Rochester, N. Y. "Manufacturing costs cut 74% while contouring stainless at 1000 sfpm to 16 mu-in. finish."

Jones & Lamson turret lathes are built and powered to produce...

MORE CHIPS per tool
MORE PIECES per hour
MORE PROFIT per job

than any other turret lathe of comparable size!

Write Jones & Lamson for details

JONES & LAMSON

the man who needs a new machine tool is already paying for it

J&L MACHINE TOOL DIV.

JONES & LAMSON MACHINE COMPANY, 502 Clinton St., Springfield, Vt., U.S.A.

Watch faces light up like a Christmas tree...

...when you put CIMCOOL° on the job in your plant. For CIMCOOL Concentrate—the largest selling chemical cutting fluid in the world—can increase your production and save you money. Here's why:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil hands or clothing. It contains no skin irritants. It leaves no slippery film on shoes, floors, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

See your CIMCOOL distributor for full information on all the advantages of CIMCOOL Concentrate—as well as details on the entire family of CIMCOOL Cutting Fluids.

Or contact us direct and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

- CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.
- CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.
- CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.
- CIMCUT **Base Additive** — For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.
- CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.
- CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

CINCINNATI
BICKFORD
SUPER SERVICE
Radials

For faster metal drilling . . .

This ultra-modern head . . . CHARTS and PRE-SELECTS PROPER SPEEDS and FEEDS

You chart, you control, you speed up operations and have a record for reference with this advanced head. The prescheduling chart plans sequence of operations and is a complete guide for the operator. Instant, quiet, hydraulic selection and changes of 36 speeds and 18 feeds are preselected by two convenient, easily read dials. Controls for clamping of column, arm and head, and arm elevation by power are at the operator's finger tips.

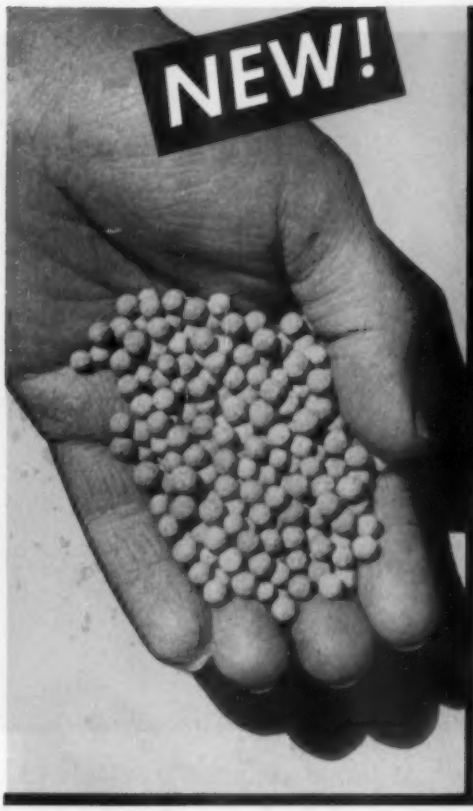
Built in 4 foot to 8 foot arm, 13 inch to 19 inch column. Spindle speeds may be as low as 8 RPM or as fast as 2300 RPM.

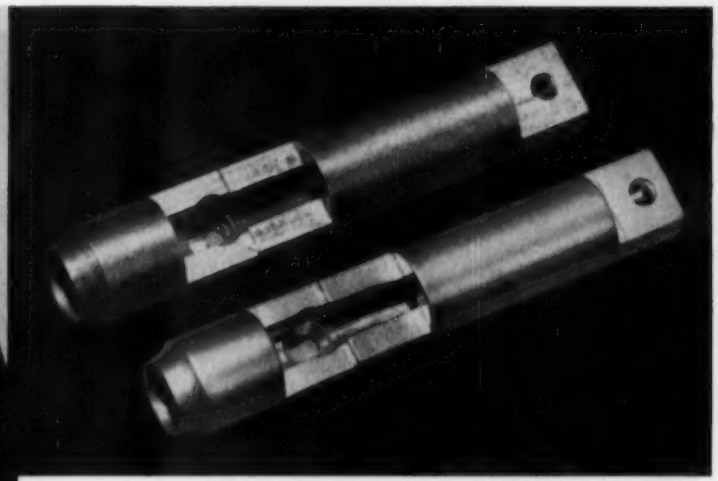
Write for Bulletin R-33 describing this ultra-modern tool

CINCINNATI BICKFORD

C B G L **RADIAL AND UPRIGHT DRILLING MACHINES**

CINCINNATI BICKFORD DIVISION
GIDDINGS & LEWIS MACHINE TOOL COMPANY
OAKLEY, CINCINNATI 9, OHIO, U.S.A.





The new ALUNDUM Tumblex "S" abrasive rolls around and through intricate parts; brings high uniformity of radii and surfaces, with smooth finish, to the barrel-finishing of parts as intricate as this gun component. The "before and after" view shows you how the spheres improve external and *internal* areas.

Besides this 5/16" diameter size of Tumblex "S" you can order it in four other sizes, up to ½". This means top barrel-finishing performance for you, in many different applications. And these new spheres are exceptionally dense and long-lasting.

Another big advance in barrel-finishing

Norton Tumblex "S" abrasive spheres

From the pioneer of ALUNDUM bonded triangles — now, new bonded spheres to help you do a better job*

If you finish parts that have hard-to-contact recesses or intricate shapes, Tumblex "S" tumbling abrasive is the latest development.

Here are the logical reasons why tubing, coil springs, scissor handles, bearing retainers, pump bodies and many other parts benefit by the new shapes and sizes of Tumblex "S" — and by its top-quality as a tumbling abrasive.

- *Tumblex "S" is made in spheres that easily get into areas where other abrasive shapes can't reach.*
- *It comes in five different diameter sizes. #2, 7/8"; #3, 5/8"; #4, 3/8"; #5, 5/32" and #6, 3/16", covering a big range of parts to be barrel-finished.*
- *Made of famous Norton ALUNDUM abrasive, it cuts fast — resulting in shorter time cycles and lower costs per piece finished.*

Send Your Work Samples

Let us demonstrate in our newly enlarged Sample Processing Department how Tumblex "S" Abrasive can give the value-adding "Touch of Gold" to your product quality and cut your barrel-finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

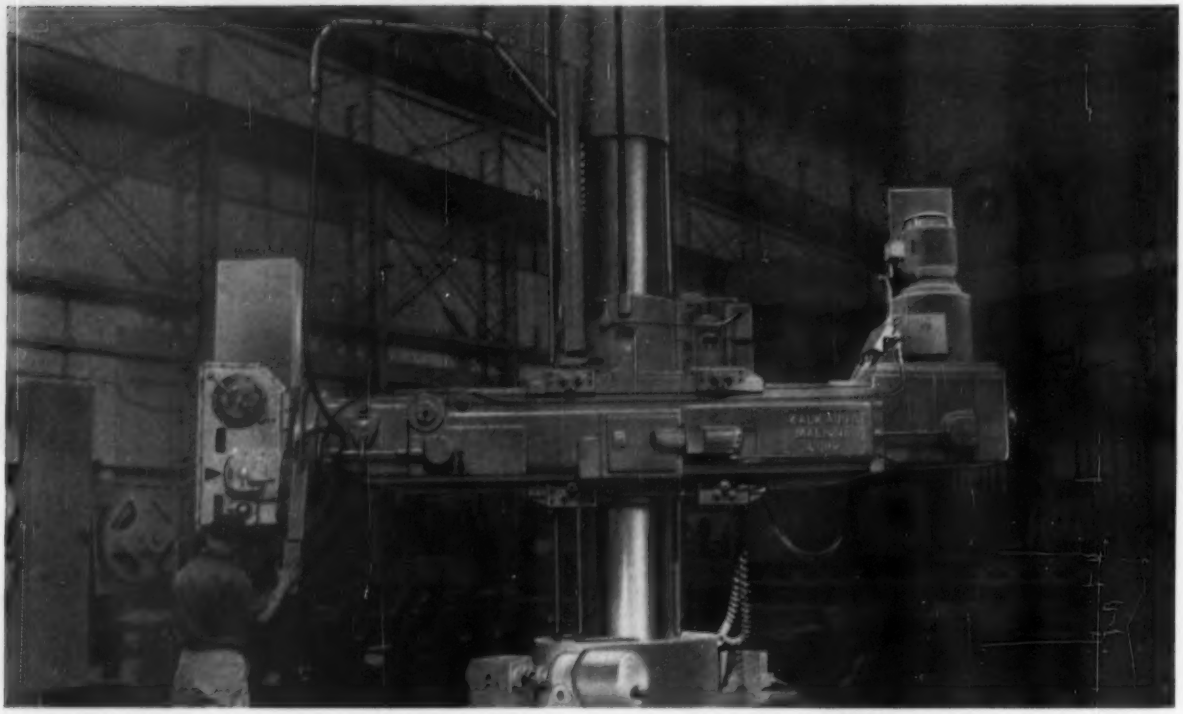
G-318

*Trade Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cut Tapes

OAKLEY, CINCINNATI 9, OHIO, U.S.A.



A JOB THAT ONLY A *Kaukauna*

UNIVERSAL RADIAL DRILLING, TAPPING AND BORING MACHINE CAN DO—

faster, easier, at lower production cost.

HOW 2 JOBS WERE PERFORMED AT THE SAME TIME ON THE SAME PIECE to save costly positioning, material handling and machine shutdown.

A nationally known manufacturer of large automotive and aviation components ordered a Kaukauna Model 140-U Portable Universal Radial Drilling Machine to be used for drilling, tapping and reaming aircraft structure sections at a multiplicity of angles. However, tooling operations on the original setup were not completed when the machine was received, so it was put to work in conjunction with a Giddings & Lewis Horizontal Boring Machine and a power rotary table.

The workpiece was mounted on the table and at the same time that milling and boring operations were being performed with Giddings & Lewis, the Kaukauna Model 140-U performed the vertical, horizontal and angular drilling, tapping and reaming operations.

Having completed this work, this portable 4" spindle Universal Machine was moved from station to station throughout the plant by overhead crane to perform the many drilling, tapping, reaming and boring operations necessary to tool up the original program.

—AND HOW THIS LED TO THE PURCHASE OF A SECOND KAUKAUNA RADIAL.

The tool room supervisors quickly realized the great savings in time and labor made possible with the Kaukauna Universal and immediately ordered the smaller 2½" spindle Model 125-U for tool room use exclusively.

Learn now what a Kaukauna will do for you by time estimates on your various jobs.

See your nearest Kaukauna distributor, or phone, write or wire direct.

KAUKAUNA MACHINE & FOUNDRY DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

KAUKAUNA, WISCONSIN, U.S.A. TELEPHONE ROCKWELL 6-4631 CABLE KAUMACH

Want to make every day Christmas?

It's easy! Switch to CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . .* and *increase your production.*

You'll say there *is* a Santa Claus after all when you learn that through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel every time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

So, to make every day Christmas, just contact your CINCINNATI Grinding Wheel distributor. Or, contact us direct and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . .

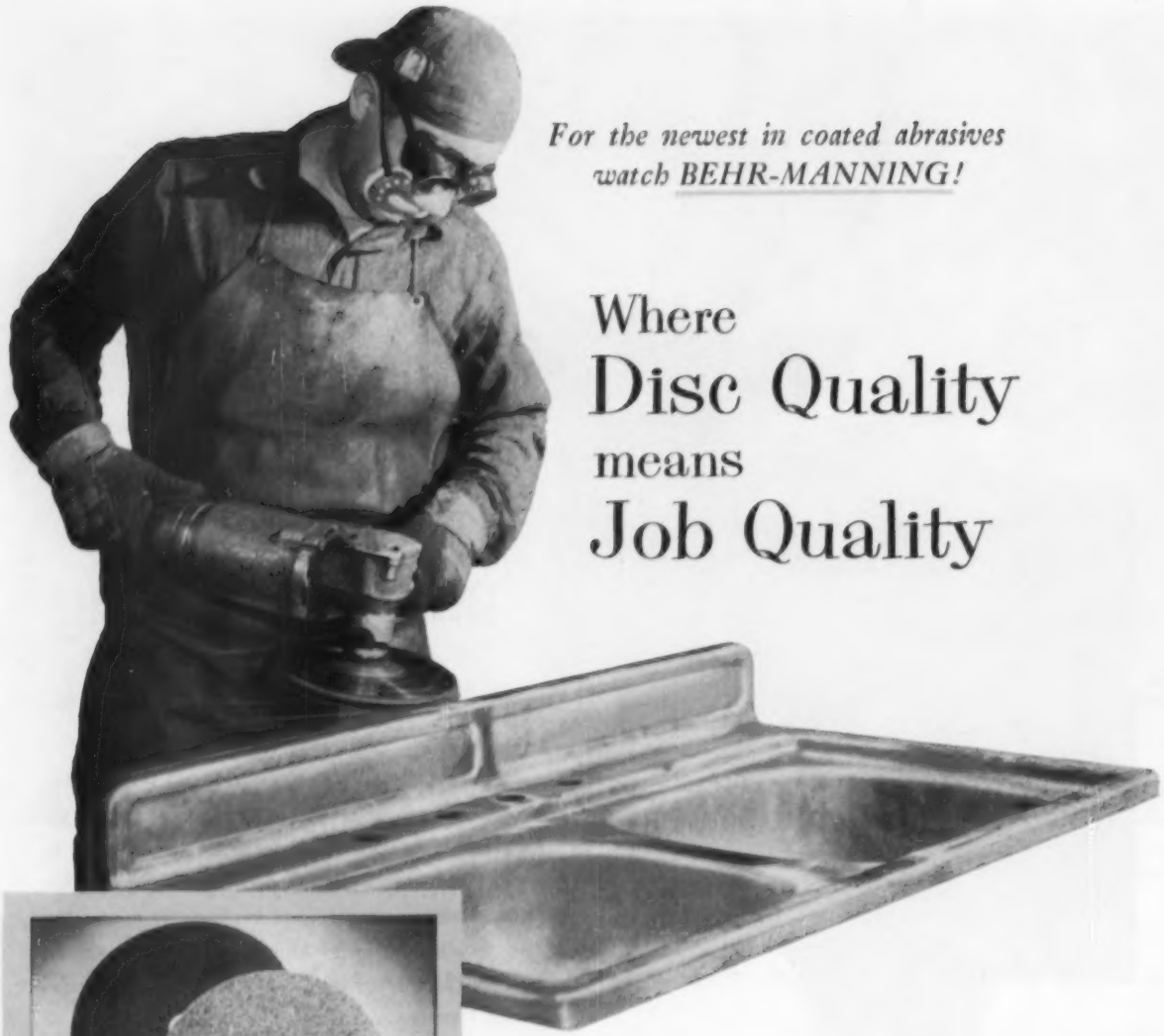
(PD) POSITIVE DUPLICATION

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

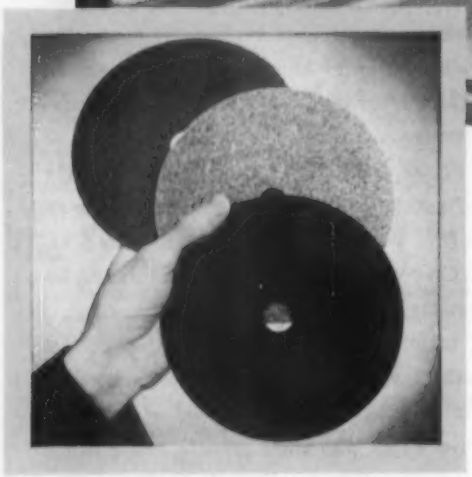
CINCINNATI° *Grinding Wheels*

°Trade Mark Reg. U.S. Pat. Off.

For the newest in coated abrasives watch BEHR-MANNING!



Where Disc Quality means Job Quality



Blue-bak, Green-bak, or Openkote — all Behr-Manning discs are known throughout industry for their dependable performance and long service life.

YOU'RE SURE of disc quality with Behr-Manning Metalite Fibre Discs—Green-bak, Blue-bak, or Openkote. They're all engineered for performance, constructed of superior materials. Grits are hard aluminum oxide, rigidly graded for uniform size. Backings are *all* strong fibre—but with plenty of "flex". Give these discs a trial now. Your local Behr-Manning Field Engineer will gladly demonstrate, or write Behr-Manning Co., Troy, N. Y., Dept. AM-12.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

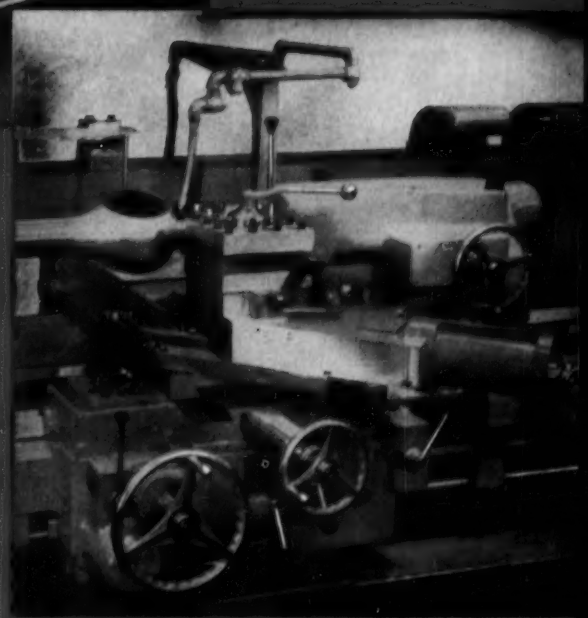
BEHR-MANNING CO.
a division of
NORTON COMPANY

NORTON ABRASIVES

BEHR-MANNING PRODUCTS. Coated Abrasives • Sharpening Stones • Behr-cut Tapes
NORTON PRODUCTS. Abrasives • Grinding Wheels • Grinding Machines • Refractories

G-7

2 hrs. versus 9½ hrs.



This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.

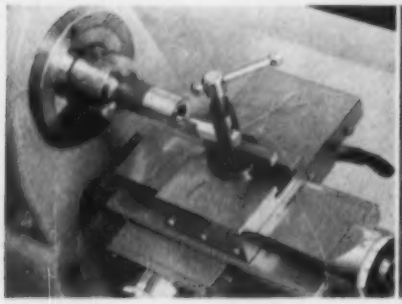
THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

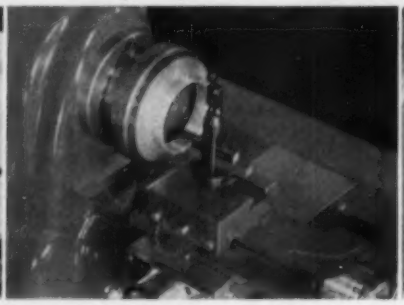
HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

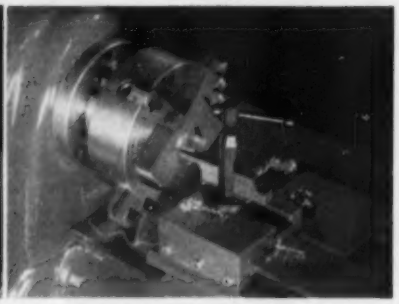
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of 1-1/16" or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".

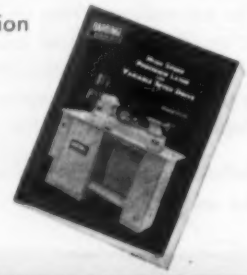


Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

SPECIFICATIONS:
1⅛" Collet Capacity
9" Swing
17" Center Distance
Infinitely Variable Speed
230—3500 r.p.m.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

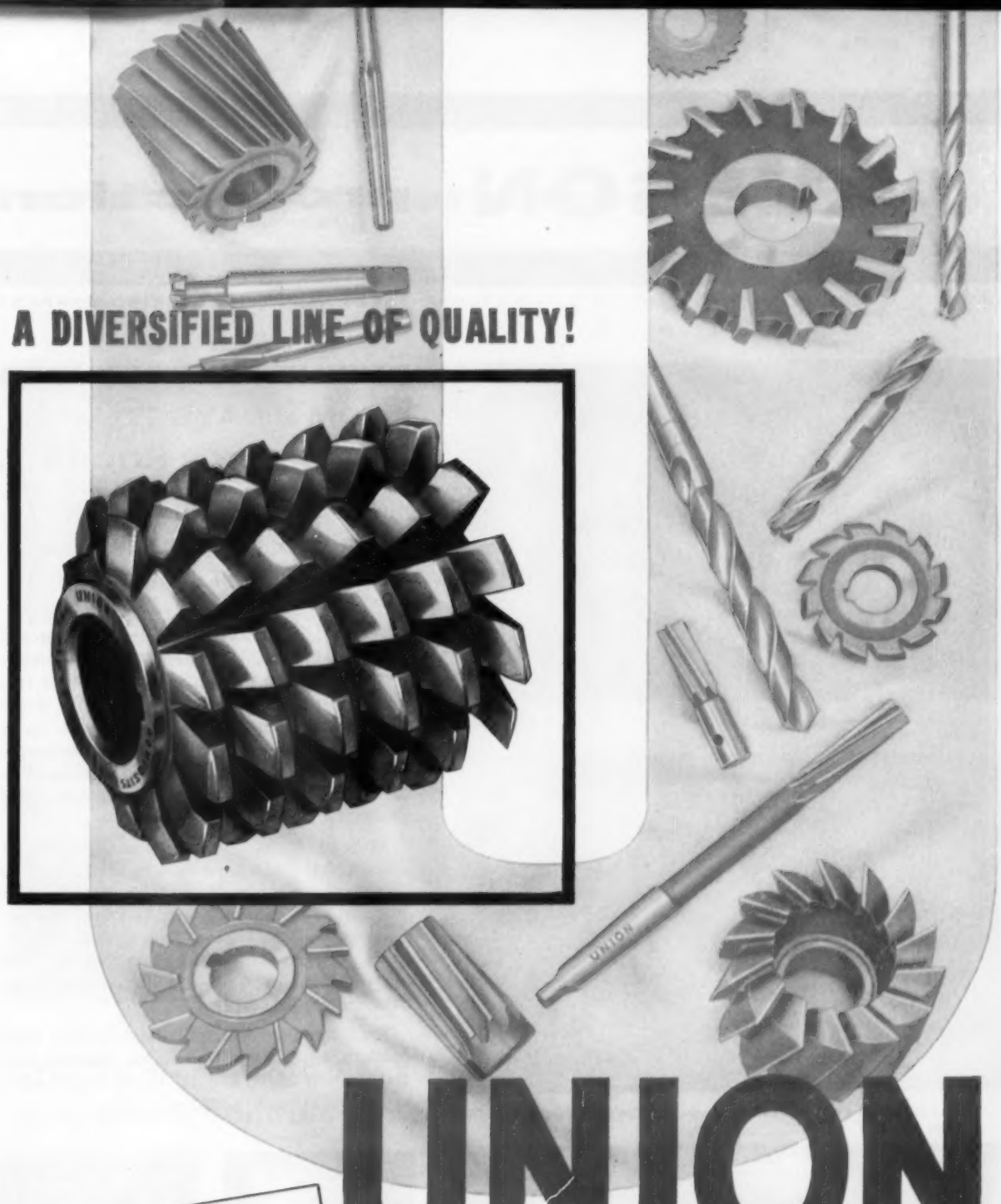
Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 3500 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy, and ease of operation assure precision results



Send for Free illustrated Bulletin DV 59

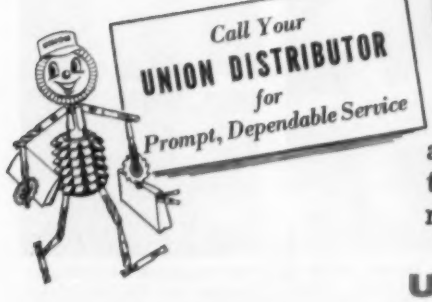
HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.



A DIVERSIFIED LINE OF QUALITY!

UNION



There's a UNION HOB ready to do the job for you, accurately and economically. UNION offers a complete selection of top quality hobs, standard and special, to suit the requirements of your job.

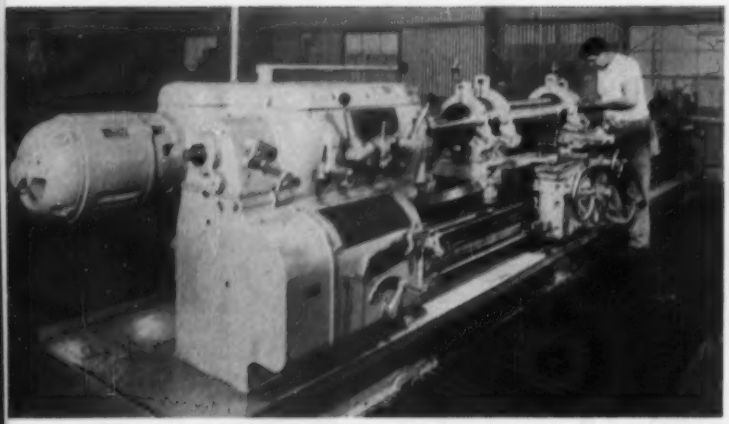
UNION TWIST DRILL COMPANY

ATHOL • MASSACHUSETTS

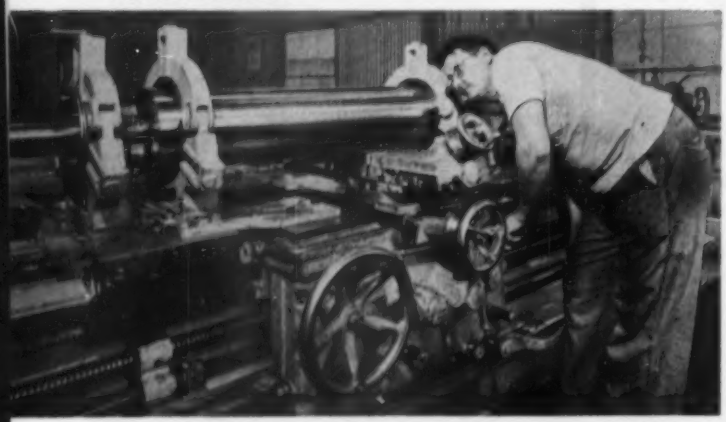
Owners and Operators of: **S. W. CARD CO. DIVISION, Mansfield, Mass.**
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Que.

AXELSON production

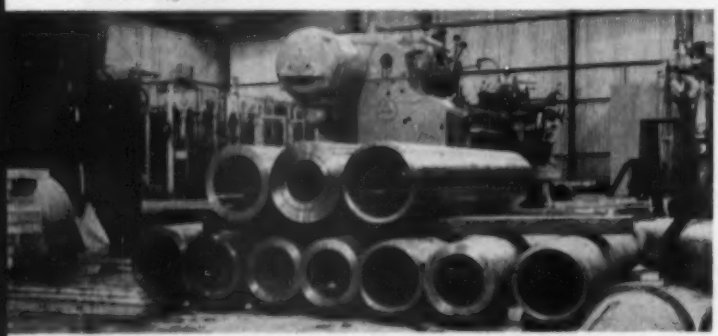
AXELSON MANUFACTURING COMPANY



Turning, boring and threading on the Axelson lathes proved faster, easier and more accurate.



Floor to floor time of 1 hour and 40 minutes includes four cuts to bore I.D. from 6⅝" to 8".



Cylinders, shown in different stages of completion, are 10" O.D., 4' long, weigh 400 lbs. before machining. Finish to 30 micro-inches r.m.s. is required for hydraulic oil well driller to operate properly under punishing conditions.

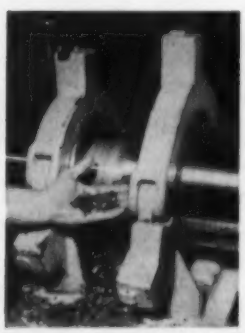
BORING TIME REDUCED FROM 2 DAYS TO LESS THAN 2 HOURS . . .

better surface finish, less taper, closer tolerance . . . on oil-well tool cylinders

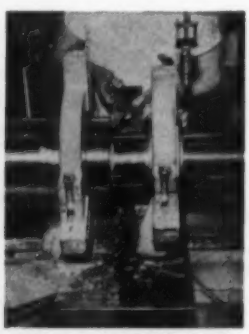
The Fluidrill, a hydraulic oil-well driller produced by Directo Corporation, Houston, operates at 100 to 20,000 feet underground, where it is subjected to brutal abuse from drilling muds, heat, rock and vibration. The component parts, and most particularly the heat-treated steel cylinder, must be machined to extremely close tolerance to function properly under these exacting conditions.

Accurate four-cut boring of this 400-pound, 10-inch O.D. cylinder was a task that had required up to two days to perform, until Axelson 20" and 25" lathes were installed to do the job! Floor-to-floor time is now 1 hour and 40 minutes; further advantages are: accuracy to 0.0015 over the 4-foot length, far better surface finish, and considerably less taper.

For a complete description and detailed specifications on Axelson Tool Room, Medium-Duty and the new 25/16 and 32" Heavy-Duty Lathes, write for bulletins A12-5507 and 5504.



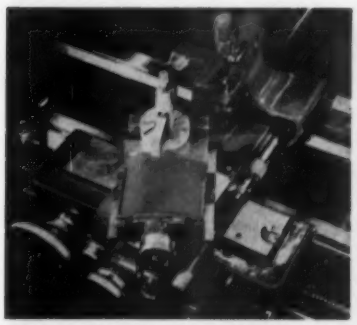
Metal chips shown are from 4142 steel cylinders. Cut is made at feed of 0.020, speed of 265 surface ft. per minute.



Carbide cutting tool being inserted into the bar. Cylinders are accurate to 0.0015" over 4' length.

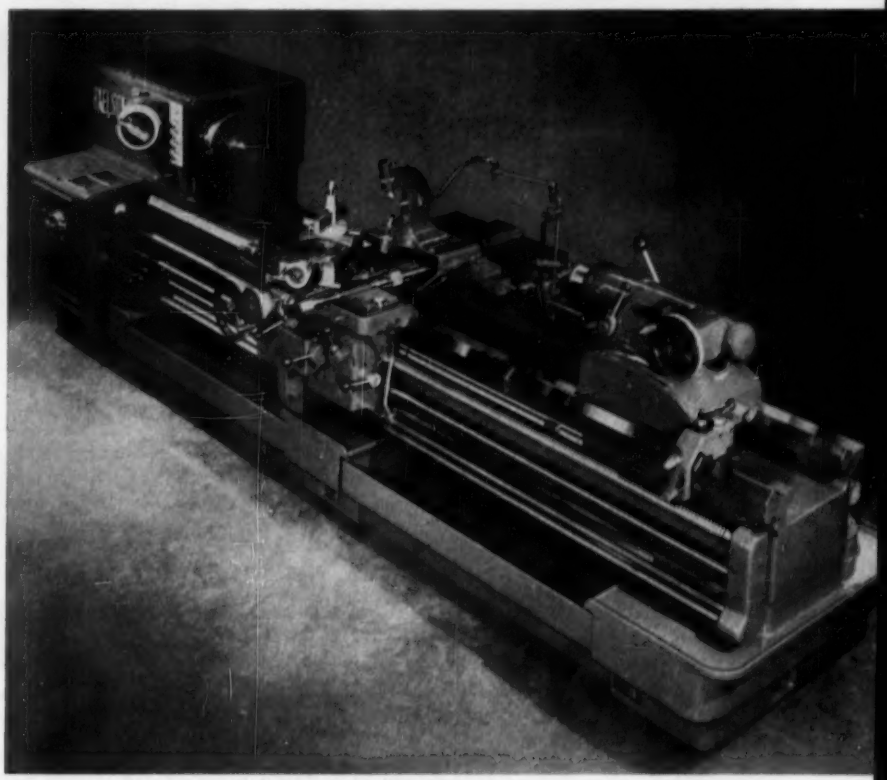
and maintenance news

DIVISION OF U. S. INDUSTRIES, INC./6160 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA



Carriage and compound are designed for maximum operator convenience.

Two-speed tailstock provides fast traverse for setup work and slow spindle traverse for feeding tools held in center.



Easy controls make Axelson 25/16 lathe a flexible tool for tool room or production.

UNUSUAL FLEXIBILITY FEATURED IN 25/16 LATHE...

convenient controls simplify operation

Versatility and convenience characterize the new Axelson 25/16 Heavy-Duty Lathe, which is equally efficient for the tool room and for production. Forty horsepower is provided over range of 32 spindle speeds, from 11 to 1600 r.p.m. Speed changes are made through involute clutches. Preselective shifting is a standard feature.

The apron, of extra-heavy, box-type construction, is completely enclosed so that all shafts, gears and bearings run in a continuous oil bath supplied by a built-in pressurized oiling system. All operating controls, including longitudinal and cross-feed, rapid traverse, head stock preselective shifting, and lead screw reverse, are conveniently controlled from the apron.

Extreme rigidity and ruggedness have been designed into all component parts. The wide bed features an exceptionally heavy girth with thick longitudinal side ribs. Center and cross ribs of equal section provide heavy-duty strength and resistance to twisting.

AXELSON

Manufacturing Company
Division of U. S. Industries, Inc.

lishing conditions.

of 265 surface ft. per minute.

over 4' length.

ARMSTRONG

The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

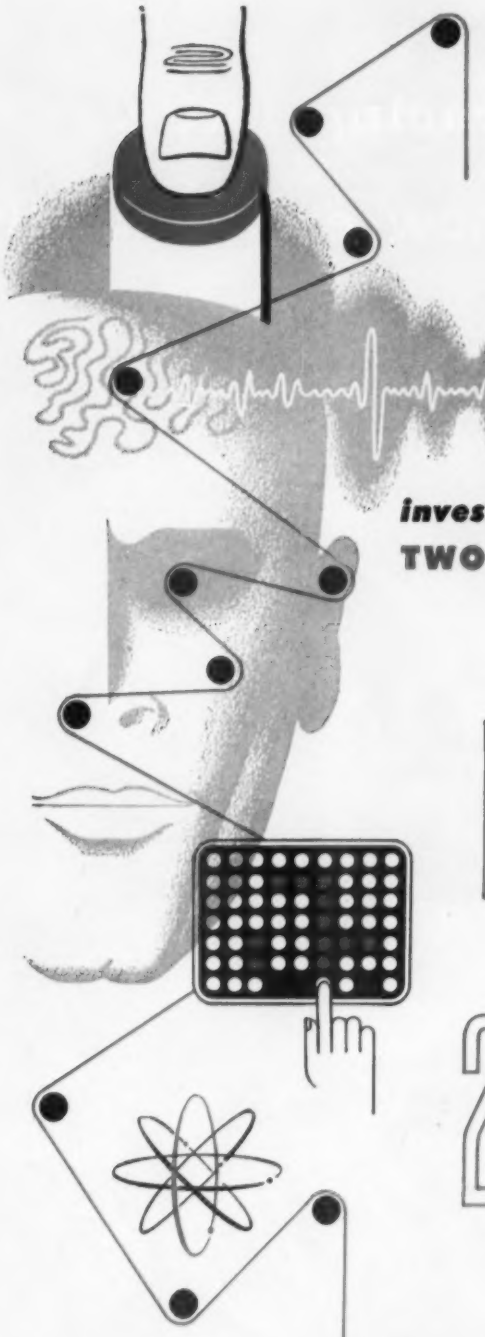
Buy ARMSTRONG TOOLS from your Industrial Distributor

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

verse, are conveniently controlled from the apron.



need creative automation assistance?

investigate **W. F. & JOHN BARNES**
TWO-FOLD AUTOMATION SERVICE

1 ENGINEERING COMPLETE PRODUCTION-LINE SYSTEMS

Complete service includes planning step-by-step sequence of operations and the individual engineering of processes, methods and equipment to meet your production needs. Barnes' creative engineering, developed over a period of 80 years in designing and building high production machine tools, can be depended upon to provide you with the latest in cost-cutting methods. Our highly versatile engineering staff will work with you as a team to solve problems quickly and efficiently.

2 DESIGNING AND BUILDING SPECIAL UNITS

To meet specific work-handling or processing needs, Barnes' engineers have designed and built special conveyors, turn-over mechanisms, inspection, and assembling equipment to suit either automatic or semi-automatic requirements. Hundreds of units are today profitably serving a wide range of industries. Because electrical, hydraulic, mechanical, tool and fixture engineering is closely coordinated at Barnes under one roof, you save time and eliminate divided responsibility.

Write for Free Literature

Ask for Production Analysis

Find out today why more and more production executives are turning to Barnes for help with their automation problems. Barnes' creative engineering staff will be pleased to analyze your requirements, offer recommendations, and provide you with a cost estimate in a formal proposal, if you desire.

Builders of Better Machines and Equipment since 1872

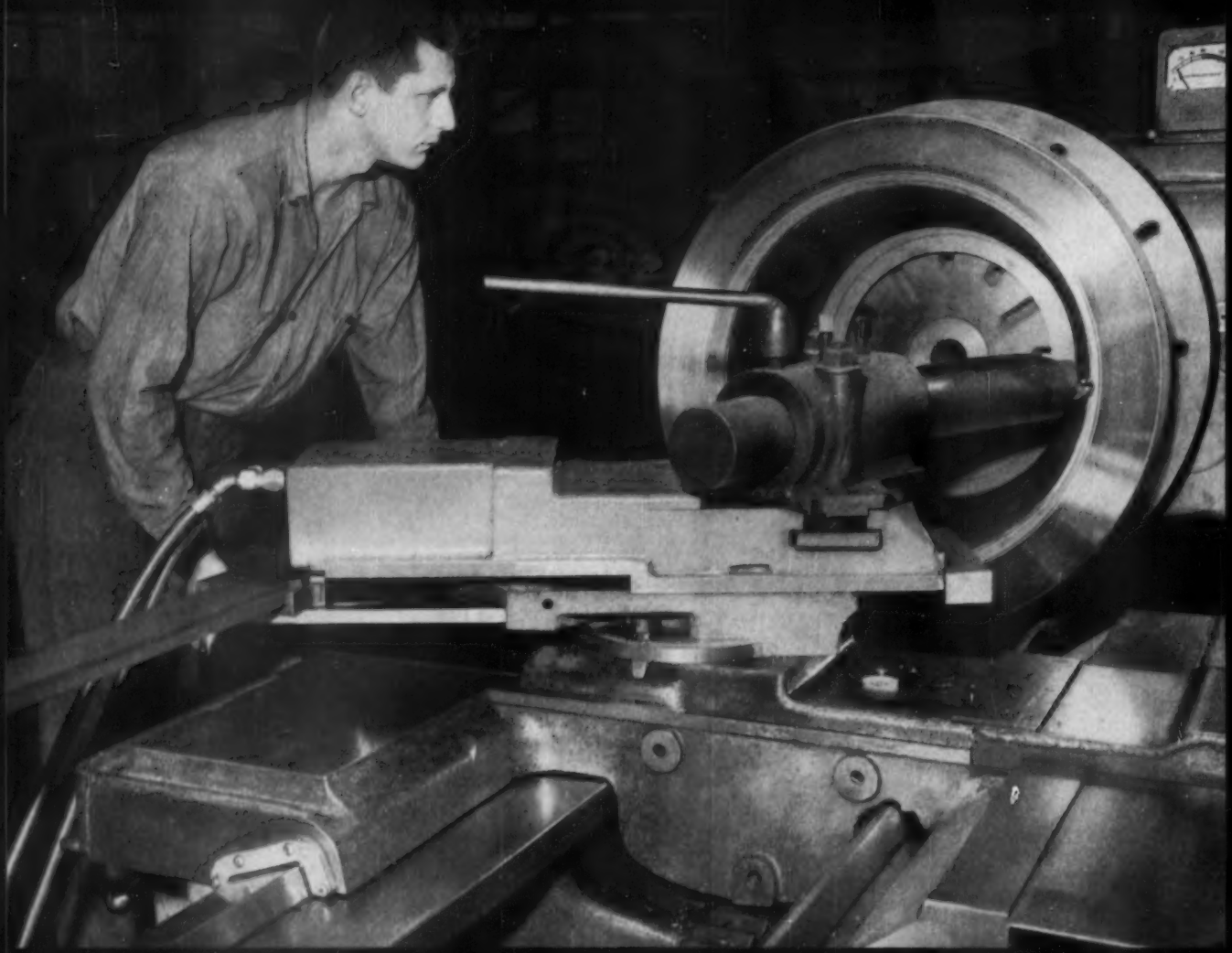
W. F. & JOHN BARNES

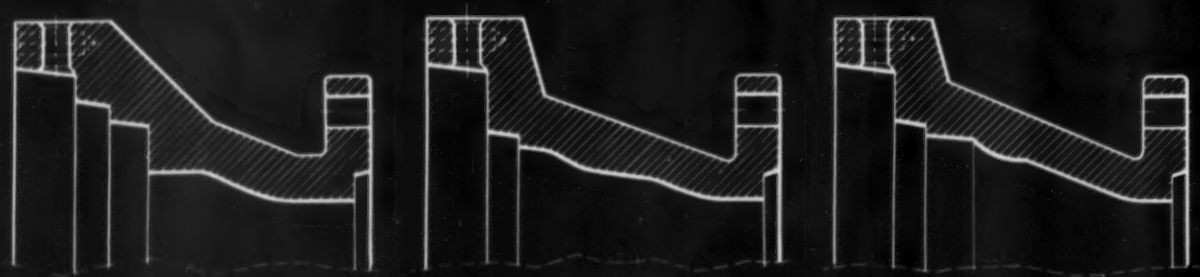
AUTOMATION SECTION

413 S. WATER ST. • ROCKFORD, ILLINOIS

SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL PROCESS EQUIPMENT • SPECIAL ELECTRICAL CONTROLS

before you buy a tracing lathe, find out how economically





you can . . .

add HYDRA-TRACE* to your Present LeBlond

American Cast Iron Pipe Co. did! Now they have all the advantages of a "new" tracing lathe, at a fraction of new-lathe cost. Actually, Hydra-Trace Duplicating Attachment is quickly and easily installed on most any LeBlond Lathe built since 1935.

This tracing-boring job at American Cast Iron Pipe Co., Birmingham, Ala., is a good example of Hydra-Trace performance. Bells for centrifugal pipe molds are machined internally with Hydra-Trace feeding at 30° angle. The part is finished in one-third time required for hand-fed turning. Details of the machining operation were worked out by LeBlond engineers, who prepared prints and template pattern for American.

LeBlond offers a wide variety of useful turning attachments. Because of the inherent stamina of LeBlond machines, our customers often solve special turning problems by adding to their present machine—good for many more years of dependable service.

Perhaps you, as a LeBlond Lathe owner, have a tracing job made to order for Hydra-Trace. Our field engineers are always on call, ready to work with you in solving your specific turning problems. Write today and tell us your needs.

*Hydra-Trace (Trade Mark registered U.S. Pat. Off.) is LeBlond's heavy-duty hydraulic tracing attachment. Can be mounted in place of compound rest on practically all LeBlond lathes built since 1935.

Simply adding HYDRA-TRACE made a tracing lathe of this five-year-old 32" LeBlond Heavy Duty—at small cost. These parts call for tracing-boring operation. Material #1025 steel; spindle speed 35 rpm; feed .016; carbide tool; finish 60 micro-inches; tolerance ±.0025. Machining time 3 hours, one-third time required for hand-fed turning.

. . . cut with confidence

LeBLOND *of Cincinnati*

THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO

World's largest builder of a complete line of lathes for more than 69 years

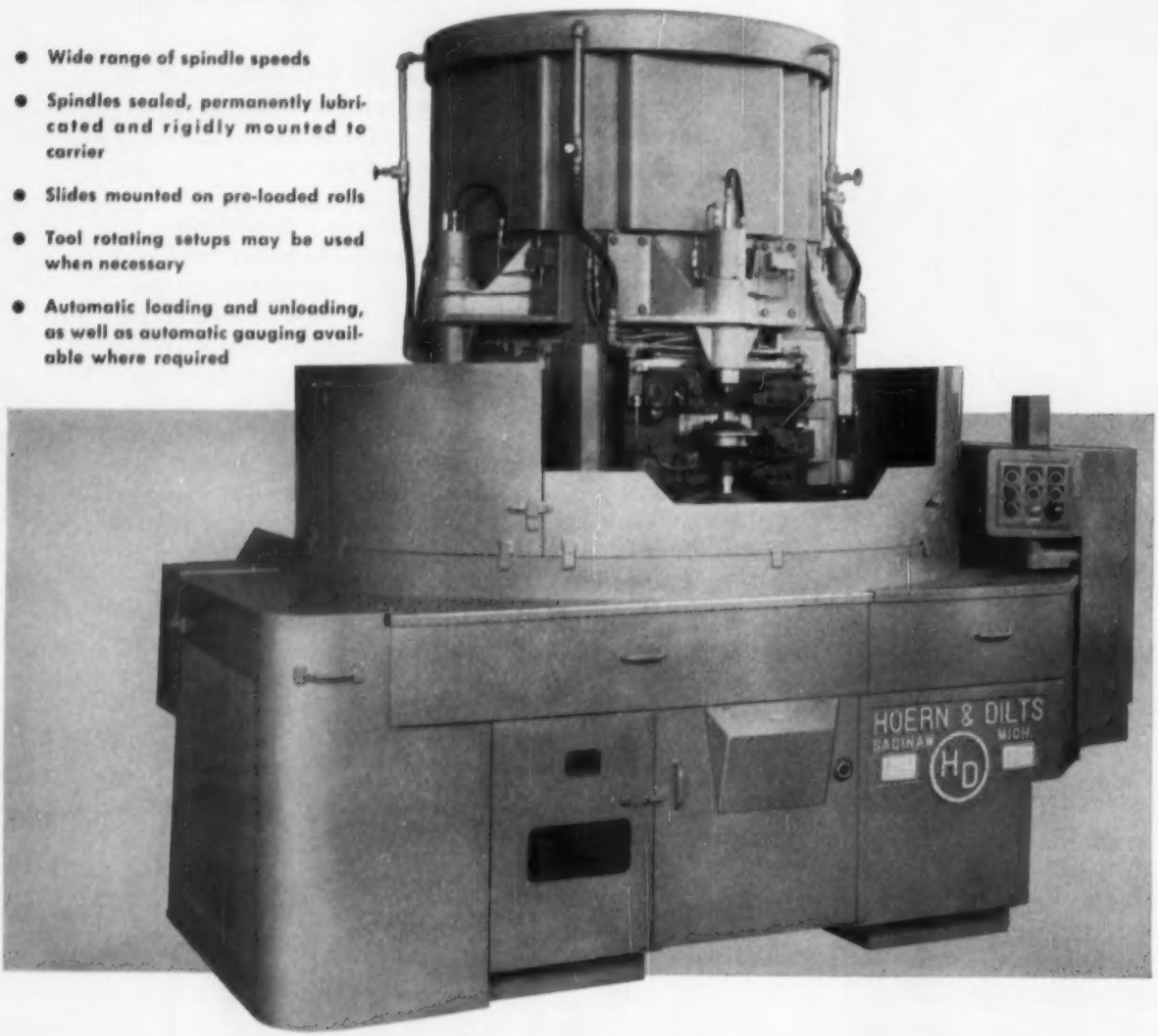
for your precision boring . . . .

5 times as many pieces every hour

Hoern & Dilts continuous boring machines have *five* sets of contour turning and boring slides, each serving one or two spindles and continuously moving around a central column. Slides and spindles travel together. Operator merely loads and unloads.

Pieces are completely turned, bored and faced in one circuit around the machine. One set of stationary cams actuating all slides provides absolute duplication of dimensions between stations.

- **Wide range of spindle speeds**
- **Spindles sealed, permanently lubricated and rigidly mounted to carrier**
- **Slides mounted on pre-loaded rolls**
- **Tool rotating setups may be used when necessary**
- **Automatic loading and unloading, as well as automatic gauging available where required**



Hoern & Dilts engineers will welcome the opportunity to cooperate with you on any high production finishing operation.

HOERN & DILTS DIVISION

The New Britain Machine Company • Saginaw, Michigan

OTHER NEW BRITAIN MACHINE TOOL DIVISIONS

New Britain-Gridley Machine Division
New Britain, Connecticut
Automatic Bar and Chucking Machines
Precision Boring Machines and New Britain +GF+ Copy Turning Lathes

Lucas Machine Division
Cleveland, Ohio
Precision Horizontal Boring, Drilling and Milling Machines

BUTTERFIELD

The Butterfield tools you buy more than meet the quality control standards set for your product.

- Long Cutting Mileage
- Smoother Finishes
- Guaranteed Top Performance

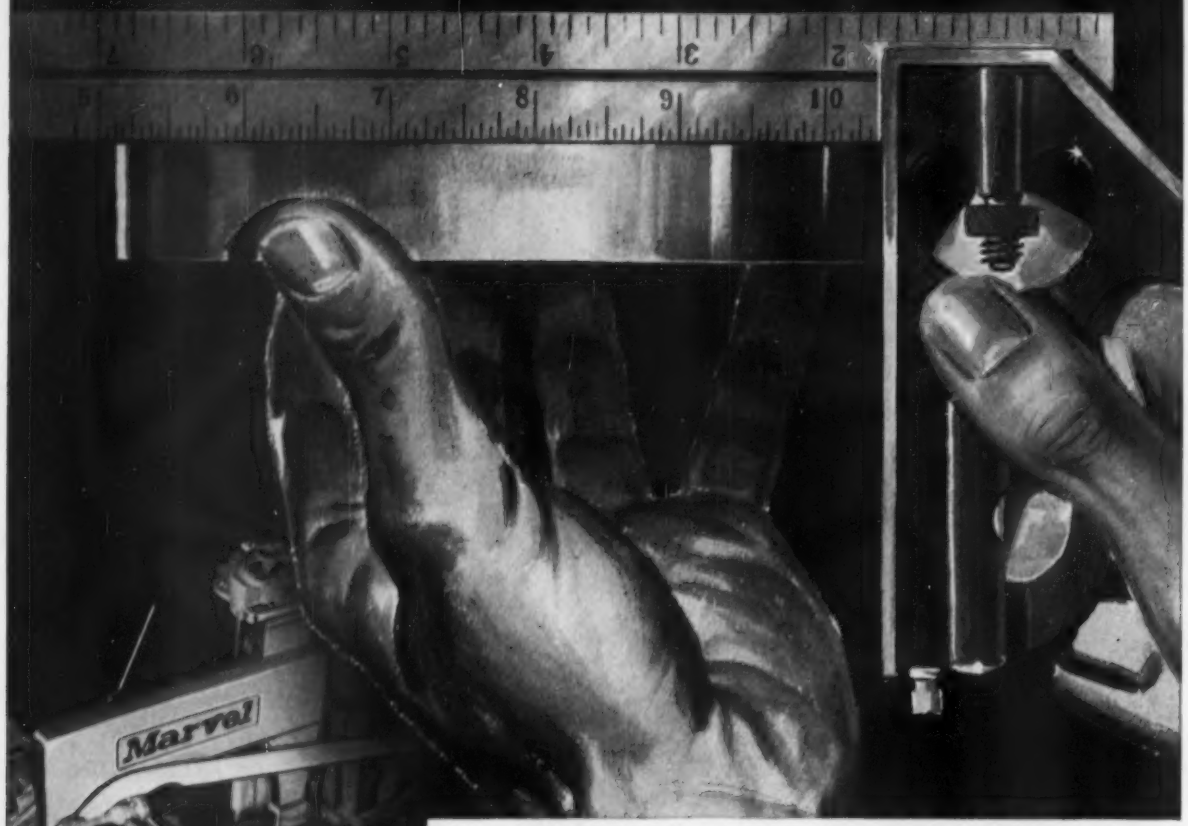
UNION TWIST DRILL COMPANY

BUTTERFIELD DIVISION

DERBY LINE, VERMONT, U.S.A.

USE YOUR LOCAL BUTTERFIELD DISTRIBUTOR TO YOUR ADVANTAGE.
You get lower inventory costs, expert counsel and "hurry-up" service.

IN CUTTING-OFF OPERATIONS...



...SPEED WITHOUT ACCURACY IS COSTLY!

Efficient cut-off of steel blanks from bars demands a combination of speed *and accuracy*. MARVEL, and MARVEL alone, achieves this combination with machines capable of delivering feeds and speeds which fully utilize the strength and heat resistance of the modern high speed hack saw blade.

MARVEL dual power feed and crank lever method of reciprocation are two exclusive features designed to give increased speed and efficiency. This unique dual power feed employed on the Series No. 6 and No. 9 MARVEL Ball Bearing Hack Saw Machines, simultaneously controls both positive feed depth and feed pressure, automatically adjusting both pressure and depth of feed correctly in proportion to the number of teeth in contact with the work. This automatically forces the blade to cut as deeply as possible and practical on every stroke, without demanding the attention of the operator. As a result, the work is cut-off in the fewest possible number of strokes. Quick return of the saw frame on the non-cutting stroke, accomplished by the crank lever, delivers 33⅓% more cutting strokes per minute without increasing the blade velocity on the cutting stroke.

Accuracy is assured by the construction of the machine itself. Anti-friction ball or roller bearings are used at all load carrying points. The saw frame reciprocates on fully enclosed special design ball bearings which are factory adjusted with a pre-load, assuring permanent frictionless rigidity. Saw frame, saddle, and upright are precision machined and fitted to form a rigid integral unit capable of withstanding any cutting load with no deflection or side movement.

These exclusive features found only in MARVEL Hack Saw Machines, together with the unequalled performance of the unbreakable MARVEL High-Speed-Edge Hack Saw Blade, form a team that guarantees the fastest, most accurate cutting-off.

There is a MARVEL field engineer near you capable of intelligently discussing your cut-off work. Send for catalog C-55, and the name and address of your nearest MARVEL field engineer.

S-1300

ARMSTRONG-BLUM MFG. CO.
5700 WEST BLOOMINGDALE AVE. • CHICAGO 39, ILL.

Metal Cutting MARVEL SAWS
Better Machines—Better Blades

First with NEW "Automatic" Service

Cone was the first builder of multiple spindle automatics to provide machine users with an experimental service in the application of carbide tools.

This service is a practical means of determining the possibilities of carbide tools for production men without loss or interference with their regular production schedules.

A pamphlet "FOUR STEPS WITH CONE" describes this service. Send for your free copy.

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

NOW
L&I
introduces

Highest Precision

DRILL &
REAMER
BLANKS

LAVALLEE & IDE, INC.

AVAILABLE
FROM STOCK

Drill Blanks
up to ½" +.0000", −.0003"
over ½" +.0000", −.0005"
Reamer Blanks
up to ½" +.0002", −.0000"
over ½" +.0005", −.0000"

- Fractional Sizes 1/16" thru 1"
- Wire Gage Sizes #1 thru #80
- Letter Sizes A thru Z
- Complete Sets

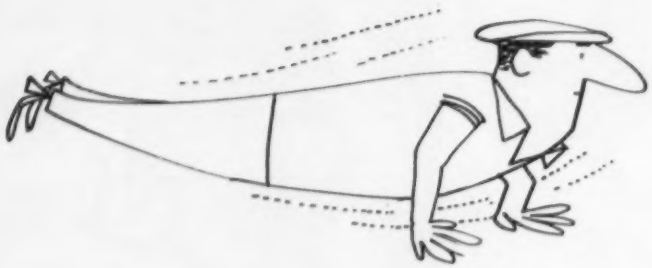
Any size from .0135" thru 1.0000"!

L&I

"the reamer specialists"
LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, N Y 36, N Y



Whither Automation?

Congratulations on your vivid presentation of "The Latest in Automation," (*AM*—Sept 10 '56, p129). So much startling information concisely given is a real pleasure to read. Timing is the essence of all campaigning, and your arresting article appears at a time when everyone in Britain is daily reading and hearing about this second industrial revolution.

Unions are doubtful and uneasy concerning the possible impact of this new science on full employment, while employers are exultant, confident that automation will result in more employment, not less. The men on the shop floor are slightly bewildered by the sweep and content of your article, and the feeling of a discussion-group meeting can perhaps be summed up in the words of the machine shop super: "Arabian Nights has nothing on De Groat's account of automated assembly."

Our top-level pessimist, the assembly foreman, had a horrible feeling that he would soon be declared redundant. Ruefully, he feared a return to the coal mines from whence he came, till the "life of the party" suggested coal mining as the automist's (is there

SHOPMATES

N. Jarvis

HE'S BEEN LEANIN' ON THAT LATHE FER TWO DAYS AND HE AIN'T TURNED IT ON YET ... IS HE TRYIN' TO GIT HIMSELF FIRED ??
THE ONLY THING YOU CAN GIT FIRED FOR IS MAKIN' MISTAKES.. YOU ONLY MAKE MISTAKES WHEN YOU WORK.
THEY WON'T FIRE HIM! THEY'RE FASCINATED THAT HE OUT SMARTED 'EM WHEN HE TALKED 'EM INTO GIVIN' HIM A JOB.
H. JARVIS

AUTOMATION

AND
AUTOINSPECTION
SYSTEMS, CIRCUITS
AND CONTROLS
HAVE BEEN OUR
BUSINESS FOR
MORE THAN A
DECADE. IT
WILL PAY YOU
TO CHECK YOUR NEEDS
AGAINST SHEFFIELD
EXPERIENCE

WRITE DIV. 1, FOR BULLETIN NO. AU-1154

THE SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.

SHEFFIELD
MASTER CRAFTSMAN HEADQUARTERS

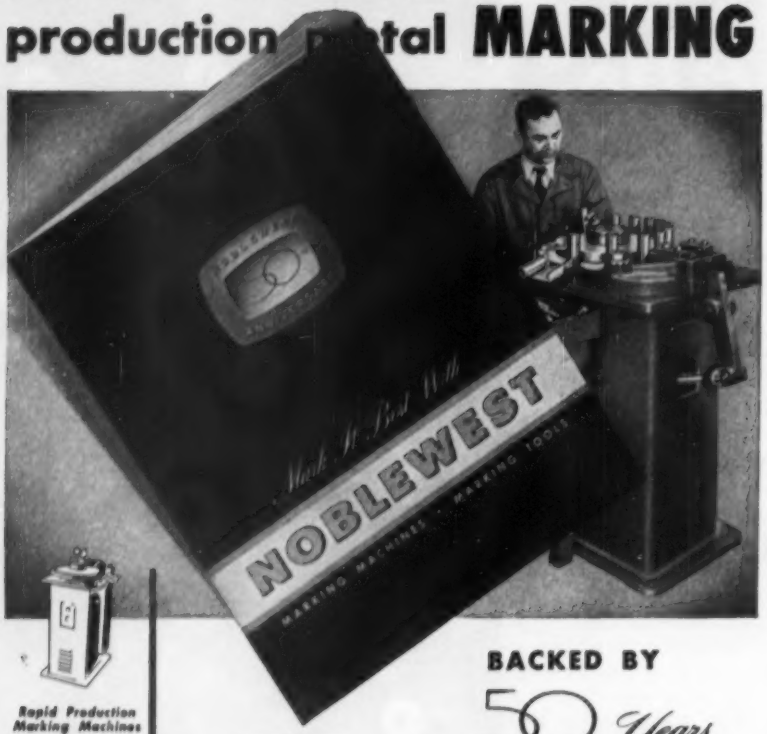
SHEFFIELD

MANUFACTURING AND MEASUREMENT FOR MANKIND

7153

1. Gaging cylinder bores for selective assembly
2. Controlled honing of gear blank bores
3. Automatic gage for 100% inspection of small arms ammunition
4. Connecting rod inspection
5. Controlling the grinding of ball bearing races
6. Post-process size control of bearing races
7. In-line inspection of automobile part
8. Controlling 12 grinding machines
9. Controlling bore size of pinion blanks
10. Automatic gaging of crankshaft main bearings

NEW GUIDE to modern production metal MARKING



Rapid Production Marking Machines

General Purpose Marking Machines

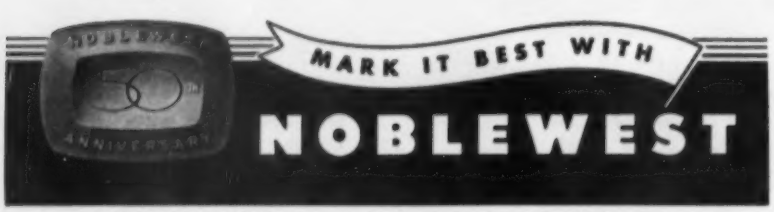
Precision Marking Dies

Automatic Numbering Heads

BACKED BY 50 Years Experience AS MASTERS OF METAL MARKING

For half a century NOBLEWEST has been solving industry's marking problems . . . designing and building equipment for faster, better, *permanent* marking of metal products at lower cost. NOBLEWEST is the originator of the *Roll-Marking Process* and many other innovations in rapid production metal marking. In this, our 50th year, we derive great satisfaction from the knowledge that more and more leaders of industry continue to bring their marking problems to NOBLEWEST.

May we send you a copy of our new catalog containing the complete NOBLEWEST line of MARKING MACHINES and MARKING TOOLS? Just send us your name and title on your company letterhead.



Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

such a word?) next objective. It was, of course, agreed that all industry could not be automated and the general opinion seemed to be that, for those employed on pushbutton assembly, compulsory physical jerks (setting-up exercises—Ed.) would be necessary to keep muscles from growing flabby. More power to your elbow, Sir.

C D Mackinnon
Airdrie, Scotland

"Hot" Oil

Some little time ago (*AM*—Sept 24 '56, p165) you raised the matter of the possible effects of radiation upon cutting fluids and lubricants.

Our research people feel that, although no information has been found on the action of irradiation on cutting oils specifically, it is expected that the effects would be similar to the results on the individual components, i e, petroleum hydrocarbons, water, and additives such as fatty acids. In general, liquid hydrocarbons undergo polymerization and gas formation. It has been estimated that about 10^8 rad absorbed (430 Btu/lb) will cause about 25% damage to petroleum-based fuels, lubricants, or hydraulic fluids, and it is assumed that service usefulness ends at such a point. Such an amount of radiation would be obtained in about seven days in a reactor such as the one at Oak Ridge.

Irradiation of water results in increased corrosive properties and gas evolution. Organic additives would be damaged similarly to hydrocarbons, but probably more extensively. In a mixture of the components in cutting oils, there is a possibility that one of the materials might "protect" the others by decomposing while the others are not affected.

Pertinent references are:

Clark Goodman, "The Science and Engineering of Nuclear Power," Vol II, Chap 13 (By A O Allen), "Effects of Radiation on Materials" (1949).

V P Calkins, Nucleonics, 12 (9) Sept, 1954. "Radiation Effects on Reactor Materials."

E Collenson and A. J. Swallow, Quat Rev 9 (4) 311 (1955), "The Action of Ionizing Radiations on Organic Compounds."

Investigations are being made using radioactive tracers in cut-

ting oil research. Whether any information is available on the radiation effects on the oil which the presence of radioactive materials could cause has not been ascertained. The main object of such work is to determine the fate of the cutting tools. Some references pertaining to these investigations are:

Scientific Lubrication 8 (4) 11 (April 1956).

I Fennie and E Rabinowicz, Lubrication Engineering 11 (2) 126 (March-April 1955) and 12 (1) 29 (Jan-Feb 1956).

Name withheld

Czech Ceramics

Some month ago (*AM*—March 12 '56, p173) you gave very detailed information on ceramic cutting tools made in Czechoslovakia. I have just come from Brno, Czechoslovakia, where I visited the Second Exhibition of Czechoslovak Engineering, and where an improved type of ceramic cutting tool was demonstrated to me by the Czech trade officials. I understand that one American producer attempted to obtain sole manufacturing rights for this for the USA.

Officials of the Czechoslovak Ceramics Trading Corp also brought to my attention their very latest development in fused basalt products, and, because of the interest created by your article on ceramic tools, I feel that your readers may be equally interested in this latest development.

Basalt has been fused successfully to metal tubing to form an extremely hard lining that is resistant to abrasion and to many acids and chemicals. The tubes are in 20-in. sections, either straight or curved. Fused basalt is also offered in slabs, bricks, and special shapes for lining hoppers, bins, and reservoirs, and is used for transportation and handling of coal, coke, rocks, sand, cinders, slag, rubble, and other materials. The Czechs use it in central heating plants, electric power plants, cement plants, and, by law, in all mines.

Valy Z Smith
Milwaukee, Wis

Information on fused basalt may be obtained from Valy Z Smith & Co, 5906 N Port Washington Rd, Milwaukee 17, Wis.—Ed.

REED RTD

All the Foremost Spark Plugs

Have Threads

Rolled Exclusively on

REED MACHINES

COMPLETELY AUTOMATIC

Reed machines roll threads on the thin wall of spark plug shells with electrode already welded in place. Threads must be square with shoulder on part.

Rolled threads are superior. They are uniformly accurate, smooth and stronger—also more economical to produce.

Reed machines, used for both thread and form rolling, are made in 2 die horizontal and 3 die vertical and horizontal types for infeed or thru-feed rolling. They are rugged, of compact construction, easy to set up, convenient and simple to operate.

Equipped for manual, semiautomatic or fully automatic feeding, Reed machines are suitable for both small job lots and large production runs.

Write for Thread and Form Rolling Bulletin

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

157

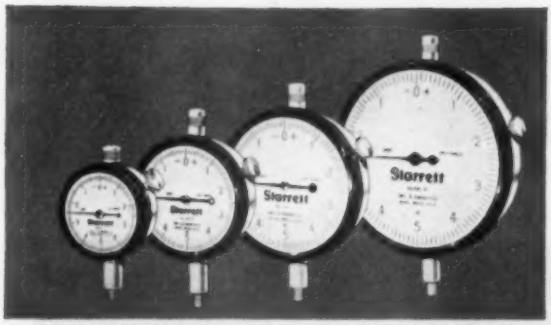
PRECISION COMES EASIER WHEN TOOLS BEAR THIS NAME... Starrett®

Ever notice how your best men insist upon Starrett Tools at the crib . . . and won't take anything but Starretts when they buy tools for their own kits? The reason is obvious . . . Starrett Tools sharpen their skill — make it easier to be accurate.

If what you want is more and better precision work, get the habit of specifying *Starrett*. It's such an easy way to please everyone and, at the same time, give the company an extra measure of quality and value.

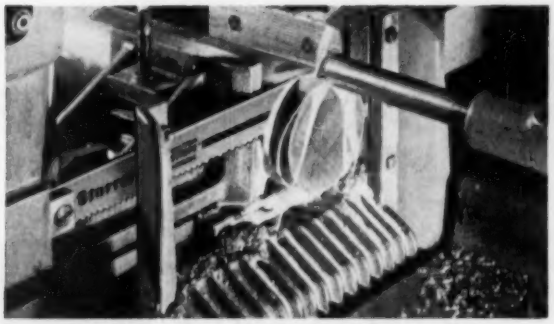
You'll find the Starrett name on a complete line of precision-made products — precision measuring tools, dial indicators and gages, steel tapes and rules, hacksaws, hole saws, band saws, band knives and precision ground die and flat stock. And Starrett Tools are always available through a convenient and reliable source of supply . . . your local Industrial Supply Distributor.

WHEN YOU MEAN PRECISION YOU SAY STARRETT



NEW HIGH-PRECISION, LOW-FRICTION INDICATORS

Featuring simple interchangeable construction with interchangeable gear assemblies; easy reading, eggshell finish dials; no-glare Satin Chrome Finish on case; black bezel. The complete line with 140 models to meet all requirements includes regular or nonshock types, balanced or continuous dials, jeweled or plain bearings, English or Metric graduations.

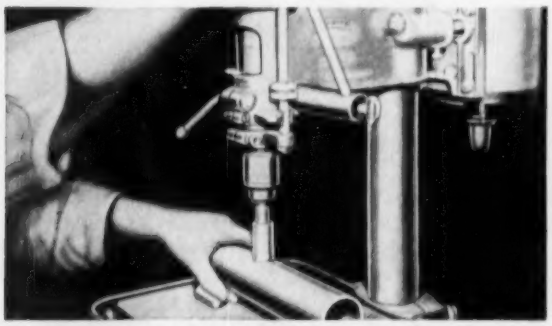


NEW "COLOR-IDENTIFIED" HACKSAWS

New Starrett Hacksaws are color-identified for quick selection and production-proved to give you the performance you need for any cutting job. Starrett also makes band saws, band knives and hole saws . . . uniform quality from one dependable source.

NO. 167 STAINLESS STEEL RADIUS GAGES

Made of stainless steel — rustproof and stainproof — satin no-glare finish. Each gage has five gaging surfaces for convex and concave radii. Available in six convenient sets. Handy gage holder also available.

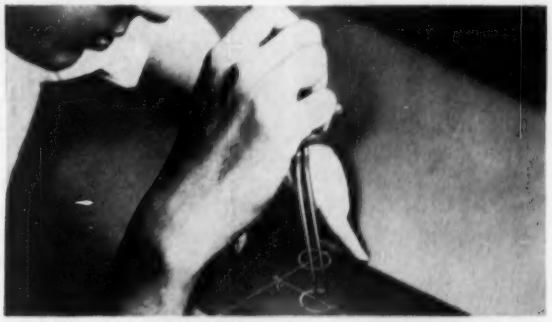


NEW SAFE-FLEX® HOLE SAWS

Use these new double-welded, shatterproof hole saws for cutting large diameter holes in metal, plastic, wood. Interchangeable arbors hold a wide range of saw sizes. Shanks fit portable power tools, lathes, drill presses, etc.

NEW MAGNETIC BASE INDICATOR HOLDER

No. 657 with off-on push button for one-hand operation has universal adjustment including sensitive fine adjustment. Holds firmly to any iron or steel surface. Mounts any "Last Word," No. 196 or No. 25 Series dial indicator.



PRECISION GROUND DIE AND FLAT STOCK

Over 1000 sizes precision ground to Starrett standards of accuracy. Available in oil, oil and water, water or air hardening types. To save valuable man and machine hours, just "lay it out . . . and saw it out."

BIG NEW CATALOG NO. 27

Describes and illustrates the complete Starrett line.
Ask your Industrial Supply Distributor or write for free copy.
Address Dept. C, The L. S. Starrett Company,
Athol, Massachusetts, U. S. A.

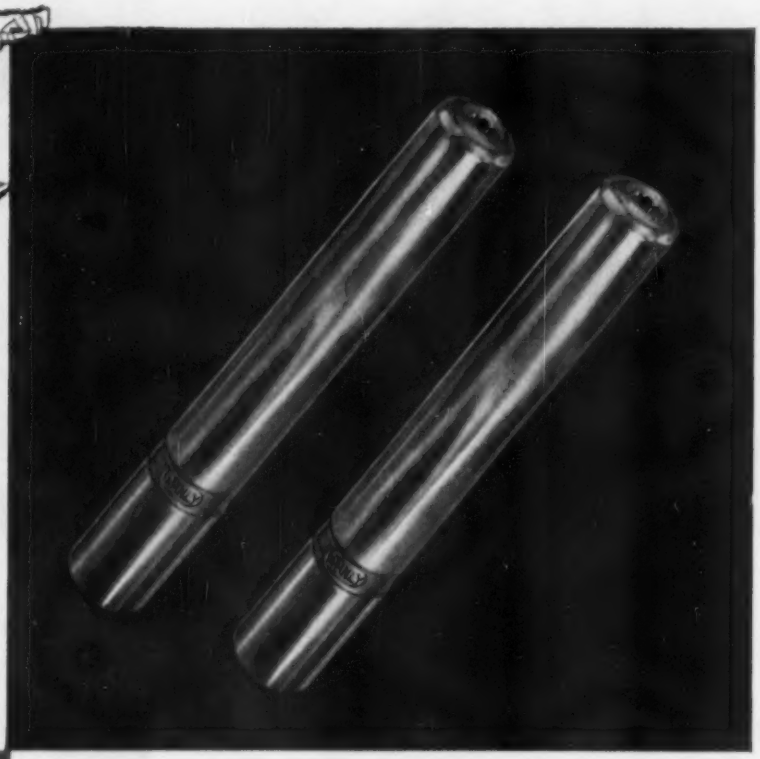
Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

Starrett

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

...AND MEASURING TOOLS AND PRECISION INSTRUMENTS
... INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

NEW "Microme" chrome plated guide posts



ON NEW DANLY DIE SETS

Now standard on all Danly precision die sets, MICROME chrome plated guide posts typify Danly leadership in die set design. Years in development, they represent only a part of Danly's never-ending effort to provide the finest in quality. These new posts are extremely hard and have very high resistance to wear. Super smooth finish helps to guarantee lasting precision performance . . . they are another important reason why you should specify Danly die sets.

Complete new "leadership line" catalog
More than 200 pages provide you with complete design information, easier selection of die sets and supplies. Write for your copy today!

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

NEWS REPORT

Spot news...

- **Russia means to take over world Metalworking leadership within five years.** Some of the things it plans to do to achieve this goal: set up 220 fully- or semi-automatic production lines; increase electric power supply per worker 60%; add enough automated equipment to cut its workforce anywhere from 80 to 90%. (See Report on Russia—Part 2, p137.)
- **$20-million loan for purchase of U S-made machine tools and equipment** has been granted to France's Simca, automotive manufacturer, by the Export-Import Bank. Also participating in the loan are the Bank of America and the Chase-Manhattan Bank.
- **Ceramic lubricants developed by Boeing** are being used for high-temperature forming of titanium between 800 and 1500 F. Such lubricants have been compounded for various temperatures—requirement is that tool and material temperatures must be within 100 F of each other.
- **Chrysler is planning 17 $3-million auto mechanics' training centers** to be spotted around the country, with the first three going to New York, Chicago and Los Angeles. It's Chrysler's proposed way to meet the current urgent need for well-trained garage mechanics.
- **Bulgarian metalworking industry is under heavy Soviet criticism** for failure to take advantage of all the new machines that country has received in the last year or two. Radio Sofia says that 3143 of the 5282 machines in Bulgaria's 43 heavy industry plants weren't used at all in the first half of this year, although 2132 of the machines were brand new.
- **Ceramic milling has proven satisfactory** on plastics and light metals, but not on iron and steel, according to tests made by Kearney & Trecker reported at ASME's recent annual meeting in New York.
- **Gas-turbine engines for automobiles may never come**—at least they're getting farther and farther away, according to a top automotive parts manufacturer. Reason: they're not flexible enough, eat up too much gasoline, and they use too many hard-to-get materials such as nickel.
- **A 12-in. capacity vacuum arc furnace for production melting of molybdenum** and molybdenum alloys has been installed at Universal Cyclops Steel Corp, Bridgeville, Pa. Furnace will also melt titanium, zirconium, iron, nickel.
- **Substantial gains in machine tool distributors' sales last year** can be attributed to improved designs and faster tax writeoffs, according to a survey of 22 American Machine Tool Distributors' Association regional chairmen, reported by AMTDA President Joseph Owens, Jr. And, Mr Owens says, tight money has had little effect on last-half 1956 orders despite all the talk about it. Some buyers, however, say that they plan to postpone expansion projects until national fiscal trends are clarified. Also reported AMTDA: backlogs of many distributors at year's end are well above those 12 months ago; 1957 shipments will at least maintain 1956 levels, with 5 to 25% gains expected in certain regions.
- **Tooling changes on '58 autos will be just as big as for this year.** The two-major-tooling-years-in-a-row cycle is indicated by the time reserved in big Michigan and Ohio tool and die shops for '58 auto changes.

Spot index to major News stories...

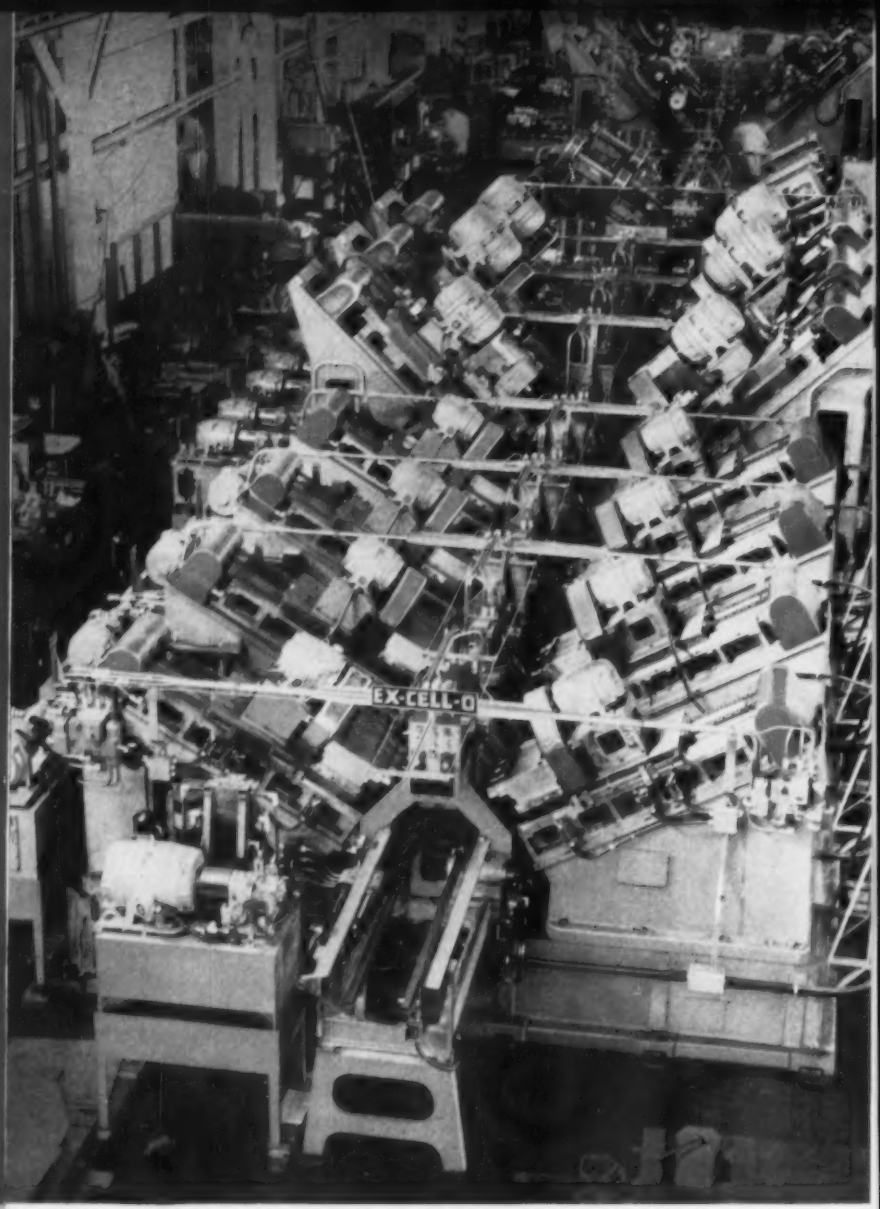
AFL-CIO's First Birthday Marks Year of Little Accomplishment 170
Chrysler Dedicates Torque-Flight Transmission Plant 170
A Swede Looks at U S Metalworking 176
Field Report 173
Foreign Report 176
Names in the News 179
Washington 99
Detroit 101
Machine Tools 103
What's Ahead in Metalworking 107
in Business 108

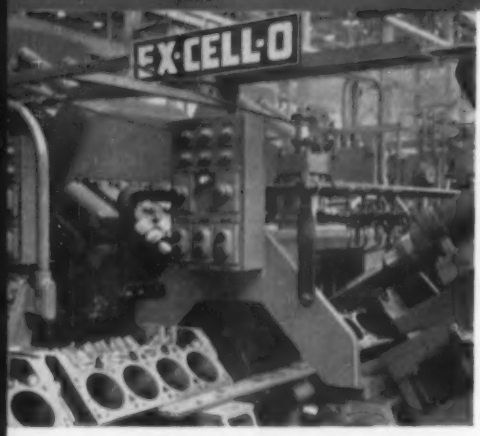
XLO

EX-CELL-O FOR PRECISION

3000 Engine Blocks Per Day -

How one company competes in the world's toughest market . . .





The photograph above is a view in the auto plant shortly after the automation line was installed. At right above, a portion of the line as it neared completion in the Ex-Cell-O plant.

These Ex-Cell-O automation machines play an important part in turning out engine blocks for one of the "big three" of the automotive industry. This manufacturer's engine must compete in one of the toughest markets in the world.

Ex-Cell-O's part in the manufacturing process is 1200 feet of production line using the newest machines in assembled integrated units. Among the precision machining operations performed are boring, broaching, chamfering, milling, reaming and grooving.

Ex-Cell-O—builders of standard and special machine tools for 25 years—uses standard bases and subassemblies wherever possible. This means that product changes do not necessarily obsolete equipment. You save, too, in initial cost.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-43

Washington ... NEWS REPORT

Effects of Suez crisis . . .

Middle East tensions had lessened at press time, and the major lasting impact of the war scare seems to be this: (1) next year's estimated boost in military expenditures, about $1.8 billion, is now more certain and may even go up some more. But the additional cost directly attributable to the Middle East flare-up is expected to be so small that it cannot be measured as an important factor in this 5% hike over this year's $36-billion military budget; (2) the much-talked-of military manpower cut of 140,000 is being reconsidered, may be postponed for at least another year for diplomatic reasons; and (3) foreign economic aid commitments will be stepped up to smooth the way for a Middle East settlement, to salve the wounds of NATO, and to provide an alternative to Russian economic domination of any European satellites which achieve some independence from Moscow.

Boom in shipbuilding . . .

U S shipyards are humming with construction work, are busier than they've been in years. The industry expects well over $2 billion worth of work during the big ship replacement period from now through the 1960's. The Suez crisis and the resulting tightness in cargo space has put an extra spotlight on shipbuilding requirements.

But excluding the current emergency as a factor, shipbuilders see even more activity in the future: seaports are spending millions to improve cargo-handling facilities for the coming rush; Naval architects and engineers are exploring new ideas in ship design, propulsion, and cargo-handling techniques.

Ships are being built to unprecedented sizes and speeds to handle the growing volume of shipments of oil and other bulk commodities. Even more significant is the advent of atomic power for merchant ships. The government is building a $40-million passenger-cargo vessel to be ready by 1960, and a tanker is being planned. In a special $11-million program, the government is also testing other new types of power plants: four Liberty ships are being fitted with a gas turbine, a geared diesel, a steam turbine, and a free-piston engine.

Most foreign yards are booked solidly into the 1960's. In fact, the rush to get tankers is driving foreign owners to U S yards, where costs run as much as 40% higher than abroad. The current steel shortage is the only bottleneck to the building program.

Military hardware shipments up . . .

Deliveries of military hard goods in the fiscal year that ended June 30 ran more than $300 million above original Pentagon estimates. The latest Defense Dept report on expenditures—or shipments—for fiscal year 1956 totals $12.1 billion. The biggest increase, $285 million, was in aircraft. The level of military aircraft shipments is expected to drop during the current fiscal year, however. Best estimate is that shipments worth $6.7 billion will be made this year, compared to $7.1 billion in fiscal 1956.

The Pentagon books show an unexpended balance of $27.8 billion for major procurement and production as of June 30—including military foreign aid. Of this sum, $7.3 billion is unobligated and represents money available for new contract awards over and above the funds appropriated for military procurement in fiscal 1957—some $11 billion.

Included in the uncommitted funds is $696 million earmarked for production equipment and facilities. This sum exceeds the $444 million actually spent in fiscal 1956 for production equipment and facilities and the $378-million expenditure now estimated for fiscal 1957.

Outlook for A-power plants . . .

Construction of nuclear power plants to produce electricity is due to expand vigorously over the next four years. Already, private industry and the federal government have eight power reactors in the works—all being built privately but many with government aid. The outlook is for additional construction of reactors by cooperatives and other public power agencies, or even by the government itself.

AEC's budget for the upcoming year is known to be substantially greater for civilian activities than it is now—and this will be devoted largely to promotion of atomic power.

Before January 1, private industry will propose building several more nuclear reactors. The atomic projects are fast losing much of their classified character.

Some experts now expect the Republican-controlled AEC to come up with a plan to put the regulation of civilian atomic matters into a separate atomic agency. This means one agency would have full control over production of all fissionable material and military matters. Another would regulate civilian programs much as FPC now regulates electric utilities and FCC regulates the air waves.

A DIRECT LINE TO TAPS

FROM YOU TO THE
WELL-STOCKED SHELVES
OF YOUR NEARBY
INDUSTRIAL SUPPLY DISTRIBUTOR...
BAY STATE, OF COURSE!

BAY STATE TAPS

BAY STATE TAP & DIE COMPANY
MANSFIELD, MASSACHUSETTS

Detroit ... NEWS REPORT

Missiles away . . .

There's plenty of reason to believe that Detroit is well on its way to becoming the missile capital of the U S. For one thing, the Army alone has let more than $100 million worth of missile contracts in the area, and the end isn't in sight.

Technical and production abilities of the automakers and their suppliers are the reason for the shift to Detroit in missile orders. Two of the biggest contracts: Chrysler's Redstone, and Utica-Bend Corp's Dart.

Other area industries are benefiting from the Detroit upsurge in missile output, too. For instance, Fruehauf Trailer Co has been allocated a $25-million contract for the development and production of ground-handling equipment.

Even the small subcontractors are getting in on the act. One such sub recently admitted that he has no earthly idea of what the part he makes contributes to the completed missile. He just received blueprints for one small part, produced it as specified, with no questions asked.

Studebaker-Packard hopes . . .

Studebaker-Packard is "on its own," according to Roy T Hurley, board chairman of Curtiss-Wright Corp, Studebaker-Packard's parent outfit. In essence, Mr Hurley meant that in no sense will defense work be used to prop up the company.

In fact, Mr Hurley stated flatly that S-P "is far more likely to absorb one or more other companies before it is merged with Curtiss-Wright."

He did not say which companies S-P has in mind, but he did indicate the company is interested in diversifying its operations considerably.

S-P's first objective is to stop losing money—and that must be accomplished before anything else can be considered. Mr Hurley said he hopes that will happen by the end of the year. After that, he predicted, S-P operations will become more and more profitable as time goes on.

Tooling appropriations for the 1958 Studebaker-Packard line are already allocated, and Curtiss-Wright is prepared to advance money to tool the models beyond 1958 if it has to. But not too much will be spent on the '58s by current industry standards—not more than $25 million.

Another Curtis-Wright project, Utica-Bend Corp, operating in Packard's old Utica, Mich, engine plant, is deep into defense work—will go much deeper. Tooling that was in the plant when C-W took over (Utica-Bend now has nothing whatever to do with automaking) is now being moved to South Bend, Ind.

New tooling is constantly being bought for Utica-Bend Corp, and future tooling should run to a considerable sum in the next few years.

Mr Hurley also added that Curtiss-Wright is in "constant contact with" and is negotiating with Germany's Daimler-Benz for "everything and anything they make." This, beyond a doubt, means that D-B fuel injection units will show up on Studebaker-Packard lines within a year or so.

The production outlook . . .

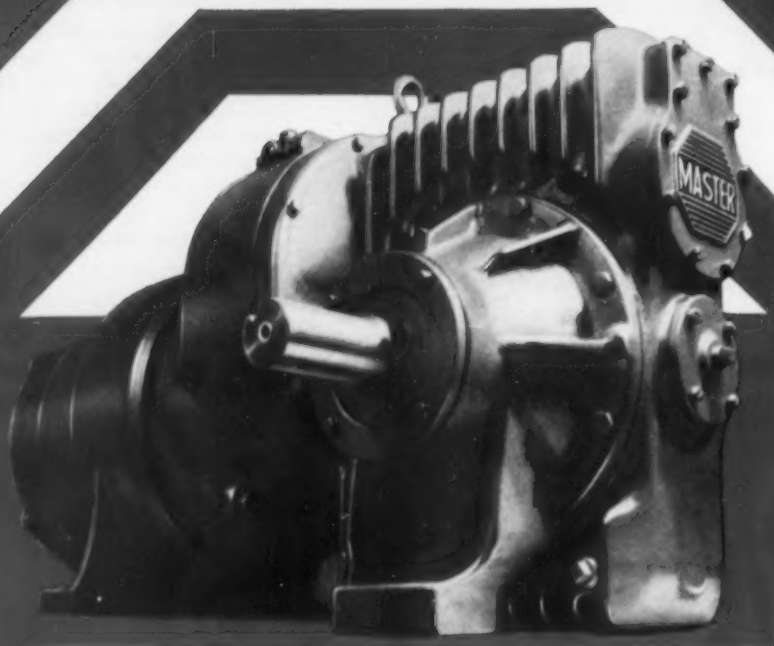
The low-priced field will build the market in the fourth quarter of this calendar year—a sellers' market is already raging. The low-priced three will take some 60% of the market, or about 1-million vehicles.

- **Plymouth** is assembling at a rate approaching 13,000 vehicles a week, with all plants except Los Angeles on a six-day week.
- **Dodge** is aiming for a November output of 20,000 cars—not up to anticipation because of hard-to-iron-out framing difficulties.
- **DeSoto** is hitting a rate of better than 3000 cars a week, and Chrysler is reported far behind orders from the field. Chrysler has two shifts going, with output approaching 3000 a week.
- **Ford** hit its highest weekly output figure since the glad days of December 1955 with output of more than 38,000 units. Most Ford plants are on a six-day week.
- **Mercury** increased its production by more than 1000 units in a single week in November, is now turning out upwards of 5000 cars a week.
- **Lincoln** production is approaching 900 units a week, but the **Continental Mark II** stopped production for most of November.
- **Over at General Motors, Chevrolet** leads the industry with almost 40,000 units a week.
- **Pontiac,** with no new-model problems showing up, is hitting about 8000 units a week. **Oldsmobile** is running slightly higher in production, and **Buick** is climbing steadily somewhere above 10,000 cars a week.
- **Cadillac** is not yet in full production of its 1957 models, but is still turning out 400 a day.
- **American Motors'** production of **Hudson** and **Nash** lines has dropped off sharply because of a supplier strike at Houdaille Industries, where its bumpers are made. **Rambler** production alone dropped off more than 400% for this reason.

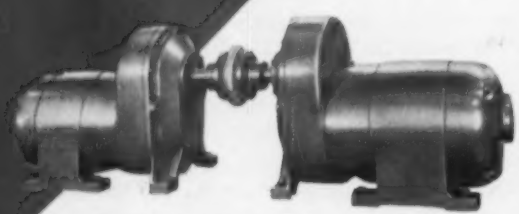
MASTER

still the All-American First

Master Gearmotors have given more millions of hours of satisfactory service in the field than all other makes combined.



CONTINUOUS LIFE TESTING
MAINTAINS
CUSTOMER SATISFACTION



How can *we* help YOU?

For five years without stopping, these two 326 frame single reduction gearmotors were run continuously 24 hours a day at full load, one as an induction generator, the other as a gearmotor. When shut down and inspected, Master's conservative design showed *gear wear of less* than .001".

THE MASTER ELECTRIC COMPANY • Dayton 1, Ohio

Machine tools ... NEWS REPORT

Orders down, shipments up . . .

Net new orders for metal-cutting machine tools fell to $66 million in October from $78 million in September and $87 million in August.

The total bookings for the first ten months of 1956 amounted to $802 million. The year's new business promises to be close to the volume attained during 1955—some $927 million.

Shipments rose handsomely in October to $89.6 million or $18.5 million more than in September. They were almost $13 million above the best previous month this year. Production for the January-October period adds up to $719 million. That means that shipments for the entire year may touch $900 million. Last year they ran to $670 million.

French builders to sell here . . .

A group of French machine tool builders, handling non-competitive lines and organized to sell in foreign markets, is preparing to set up a selling organization in this country.

Its members make general-purpose machine tools which can be sold at prices considerably under those of American machines.

The plan is to establish headquarters, including a showroom and a parts depot, in a centrally-located city. Distributors will be appointed.

The French group is not newly-formed. It has operated for a long time in other parts of the world. Its members feel that this is a good time to make a competitive try for the U S market.

Cone to build copying lathe . . .

Cone Automatic Machine Co has announced that it will make and market in this country and Canada the Pilot copying lathe under license from H Ernault Batignolles of Paris, France. The copying lathe will bear the name of the Conomatic Pilot lathe. Detailed story is on page 173.

A West German builder of turret lathes and automatics, who was convinced two or three years ago that he could successfully sell his machines in the United States, has decided to give up.

He believes that he can do better in other parts of the world than here with the same expenditure of time, effort and money. Competition from U S builders is too tough.

An eastern sales company, representing seven European machine tool builders, most of them Italian, reports that it is doing a very satisfactory business in low-priced standard machines competing against used American machines.

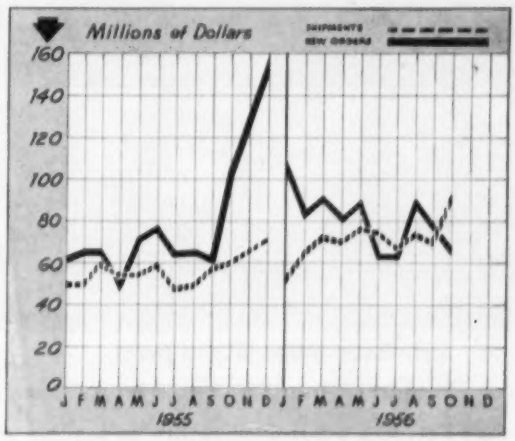
A well-known West German maker of engine lathes recently attempted without success to negotiate with a U S builder for the assembly of its machines in the latter's plant, the components to be shipped from West Germany.

Heald to build in England . . .

Heald Machines Ltd has been set up as a new subsidiary of Cincinnati Milling Machines Ltd at Birmingham, England, to build certain types of Heald machines for the European as well as the British trade.

Expanded facilities of Cincinnati Milling at Birmingham are scheduled to go into operation late this year. To tie in with production of new model machines and to make it convenient for overseas visitors, formal opening of the new facilities will take place next spring rather than in midwinter.

Australian government is proposing to cut the cost of new equipment for Australia's new factories by waiving the duty on foreign machines. The proposal would have to be approved by the United Kingdom which would suffer the most. The United States and West Germany would be the chief beneficiaries of the new policy.

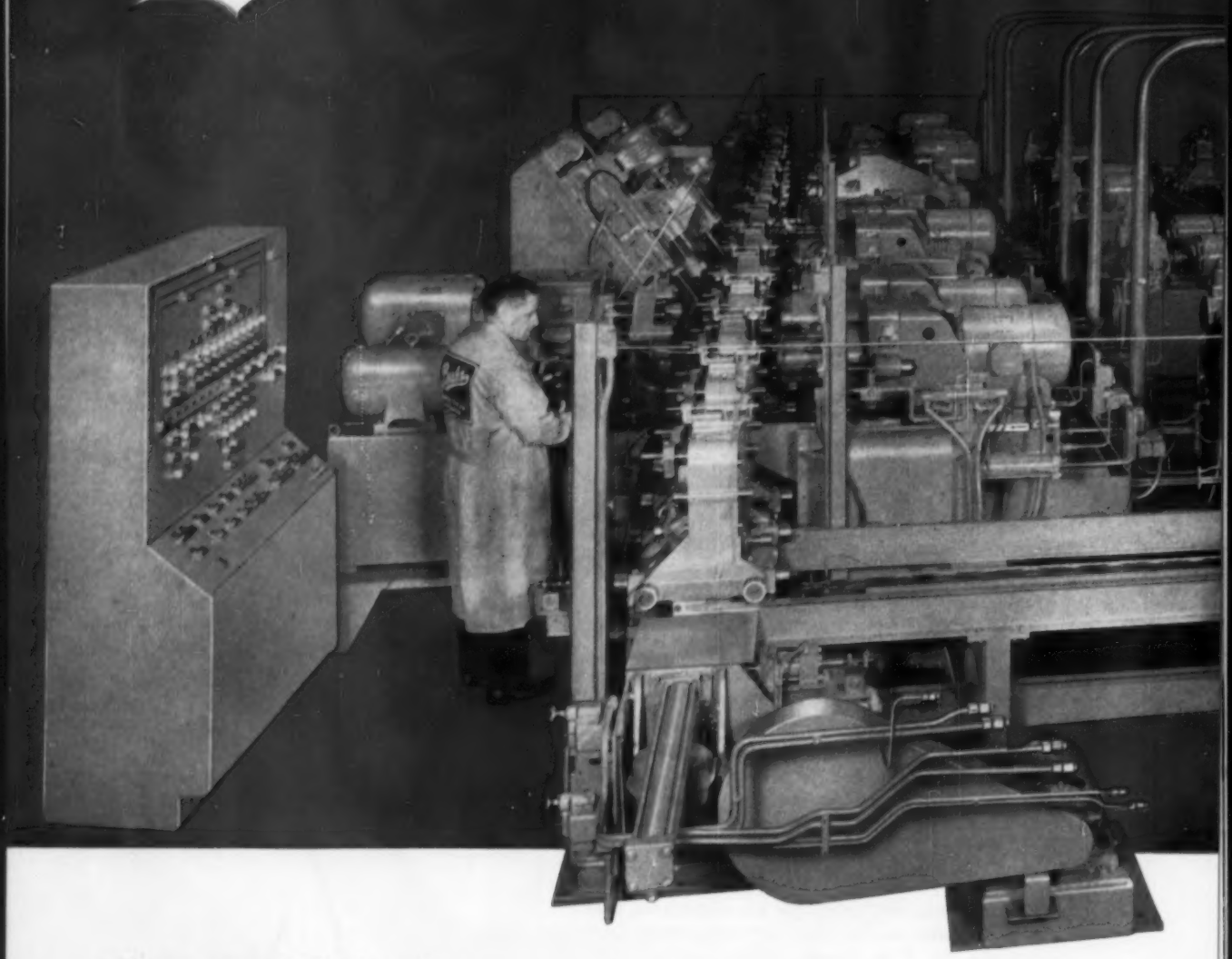


DEFINITE REVERSAL OF RECENT TRENDS (new orders for machine tools have with a very few exceptions exceeded shipments for any given month in the last two years or so) is shown in the September-October figures on the National Machine Tool Builders' Association Index: new orders dropped from $78.5 million in September to $66 million in October, while shipments jumped from $71.1 million in September to $89.6 million in October.

THE MASTER ELECTRIC COMPANY • Dayton 1, Ohio

Buhr ECONOMATIC

(15 STATIONS)



- Parts automatically clamped
- Automatic probing of tapped holes and deep holes
- Hydraulic back-up for heavy trepanning operations
- Automatic unloading of parts
- Exclusive Buhr Detector System in main console, signals and locates electrical failures instantly
- Fixtures washed on return to loading station
- Sectionalized bases to facilitate future part changes
- Automatic lubrication of all moving parts including fixtures
- All standard and special parts interchangeable for ease of maintenance
- Spindles arranged for pre-setting of cutting tools to minimize downtime for tool changes
- Hardened-and-ground steel ways
- J.I.C. Standards throughout

performs 55 operations every 23 seconds!

OPERATIONS...

~~32 drilling, 10 spotfacing,~~
~~3 rough and semi-finish trepanning, 2 reaming,~~
~~1 end-milling, 1 semi-finish bore,~~
~~1 finish bore, 7 tapping and 9 probing~~

CLOSE-UP OF AUTOMATIC UNLOAD STATION

CLOSE-UP OF FIXTURE

PART . . . automotive front pump-body

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

BUHR MACHINE TOOL CO.©

ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

Better Machining from stock to finish

for Blackstone Corporation, Jamestown, New York

The nation's oldest manufacturer of washing machines, dryers and ironers, Blackstone, uses a sizable battery of automatics for its machining. For years, lubrication with Texaco has helped achieve an enviable record of trouble-free production with economical unit costs.

Dual-purpose *Texaco Cleartex Oil AX*, for example, is used in automatics as cutting fluid and machine lubricant. The results—extra-long tool life, consistently rust-free finish, lasting undiluted strength of the cutting oil, effective protection for machines.

There is a complete line of *Texaco Cutting, Grinding* and *Soluble Oils* to help you do *all* your machining better, faster and at lower cost. Let a Texaco Lubrication Engineer help you choose the ones best suited to your needs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

What's ahead ... in Metalworking

NEWS REPORT

Winter to bring high activity . . .

The metalworking industries are winding up 1956 in a flurry of production, operating at a swifter pace as the year ends than at its beginning.

It appears that metalworking production for the year will average 172 on the American Machinist Index, which takes 1947-1949 as 100.

That is the highest average operation in peacetime in history. The next best year was 1955, when production averaged 165.

What's more, things look good ahead. There is no sign that operations will fail to hold at recent peak levels. The winter will see a continuation of high activities in almost all segments of Metalworking.

The aircraft industry is in for a good year in '57. Many airframe companies are phasing into new programs. Some of the work is beginning to get into the hands of subcontractors and suppliers, who report that backlogs are increasing.

The large amount of expansion going on among electronics makers and other aircraft suppliers indicates that 1957 has a rosy hue.

International Harvester recalled 5200 workers in November at its tractor and farm equipment plants.

Other farm implement makers did likewise. The reason is that manufacturers will build up inventories in anticipation of sales next spring in larger volume than last spring. There has not been a sudden burst of retail sales currently.

Detroit is a much more animated spot than it was even 30 days ago, as it rushes new models into dealers' hands. Nevertheless production in the final quarter may fall below that in the same quarter of 1955.

Contract tool and die shops have been doing a record-breaking business. The volume of production this year has been 44% ahead of last year, according to the National Tool and Die Manufacturers Association.

New business in tools and dies has been off the past two months, but accumulated orders still are huge.

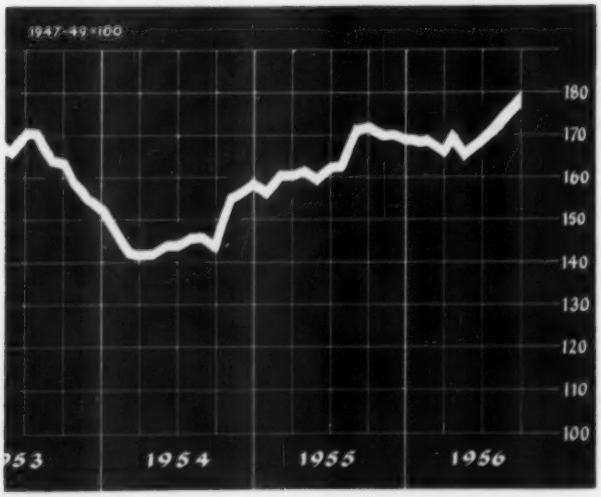
As they view 1957, some 15 tool and die shop owners expect excellent business, 59 good, and 25 fair.

Electrical machinery manufacturers are doing very well, their production having risen this fall to a height above that of a year ago. First-quarter output will be on the same expanded scale as current operations. Turbine builders are booked to capacity for the year 1957.

Steel plate is the hottest item in steel demand. The plate situation is expected to stay tight all of the coming year. Railroad car people are taking big tonnages of hot-rolled sheet and structural shapes.

Pickup in automotive releases for flat-rolled items has offset the dropoff in orders from appliance makers.

Materials-handling equipment, reflecting the deep interest in automation, is up 25% in sales this year over last. Further gain of 10% is expected in '57.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

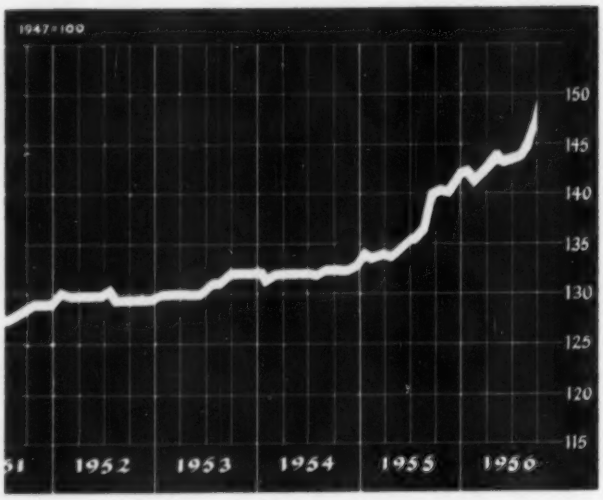
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV. Estimated	OCT. Preliminary	SEPT. Revised	OCT. Year Ago
Total Index	**180**	**178**	**176**	**174**
Machinery	156	157	145	
Electrical Machinery	217	212	207	
Autos	116	92	144	
Other Transportation	353	391	323	
Other Metalworking	150	148	145	

NEWS REPORT What's ahead...in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	NOV. Estimated	OCT. Preliminary	SEPT. Revised	OCT. Year Ago
Total Index	**149.5**	**148.7**	**147.5**	**139.9**
Metalworking Machinery		171.6	170.5	157.2
Other Machinery exc. Electrical		156.6	155.3	146.6
Electrical Machinery		149.1	147.8	136.8
Fabricated Metal Products		141.3	140.0	134.7



Small business may get a tax cut . . .

Best bet for a tax cut in 1957 is one designed to aid small business. Both parties are in favor of doing something, and are lining up behind a move to cut the corporation income tax rate on the first $25,000 of income from the present 30% to 20%. This would cut by $2500 the tax on any corporation making $25,000 or more, with smaller savings on income below $25,000.

If this idea clears Congress, look for accompanying legislation making it easy for partnerships and single-owner businesses to get the same benefit. The move will cost the treasury $600 million in tax receipts.

Another tax move designed to aid small business is backed by the administration—application of fast depreciation formulas of the 1954 Revenue Code to used machinery and buildings up to $50,000. This now applies only to new products.

Democrats are taking a look at the way the tax laws are being enforced. Since the Internal Revenue Service was reorganized in 1951, district collectors have wide authority to settle disputed cases. Rep Wilbur Mills, Democratic tax leader, wants to know whether tax payers in different parts of the country get equal treatment.

Mills will dig into a half-dozen controversial issues in hearings, but no basic changes in the tax law seem likely in 1957. Mills—and other Democrats—may come up with major proposals in 1958, however. They may recommend a tighter capital gains treatment in the law, for example. They're going to look at the accelerated depreciation provisions of the 1954 law and at tax exemption now granted co-ops. An effort will also be made by the Democrats to simplify taxation of partnerships.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	149.2	149.0	148.5
Steel ingot operation (thousands of tons)	2,458	2,466	2,416
Electric power output (million Kilowatt hours)	11,589	11,522	11,149
Production of automobiles and trucks	169,977	162,131	213,468
Engineering construction awards (Eng. News-Record—millions)	$357.6	$369.9	$305.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	145	145	143
Index of durable manufacturers' production (1947-1949=100)*	165	164	161
Durable goods manufacturers' sales, millions*	$13,730	$13,665	$13,692
Machinery manufacturers' sales, millions*	$ 3,941	$ 4,022	$ 3,474
Durable goods manufacturers' new orders, millions	$14,377	$15,166	$14,936
Machinery manufacturers' new orders, millions	$ 4,186	$ 4,195	$ 4,165

* Seasonally adjusted

*Now they call Joe a genius**

* He's no Einstein— but he figured how to cut costs in half by switching to...

NEW T-J REAMERS

with *throw-away heads!*

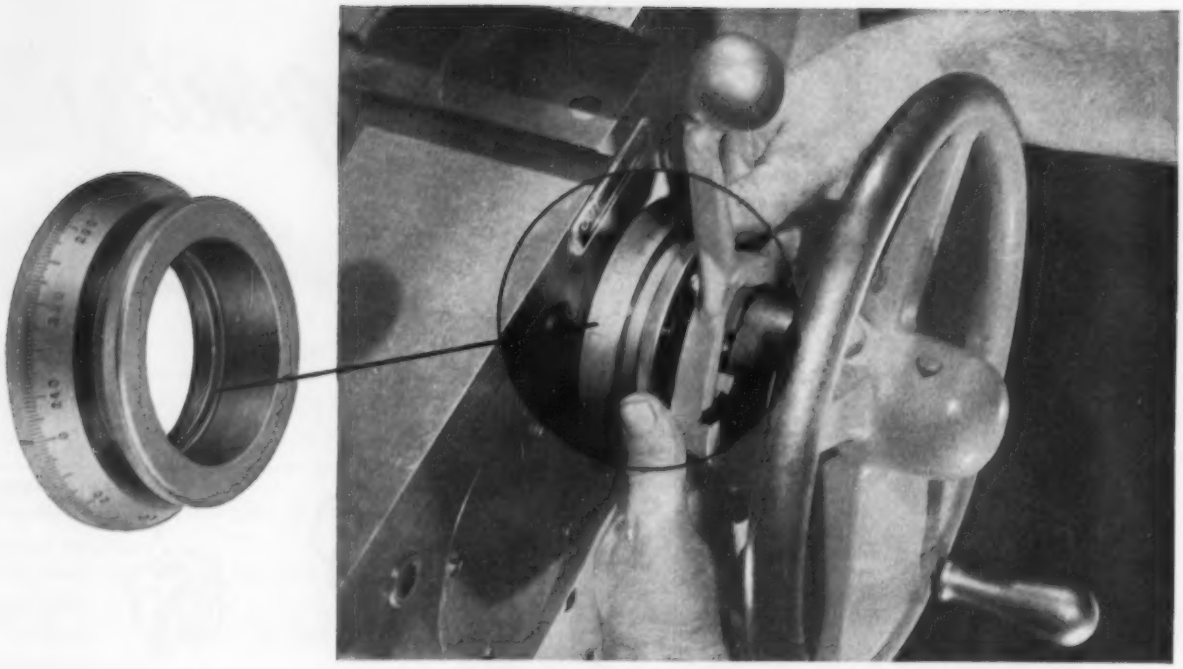
You don't have to be a wizard at figures to see how the new T-J Reamer with Throw-Away Head cuts your replacement costs to *less than half.* You *save* because you replace *only* the part that wears out. Buy original shank . . . change the head in a jiffy when worn. Wide range of head sizes from ½" to 2¾" inclusive, in 1/16" increments available with right or left hand spiral flutes for thru or blind hole reaming.

Tapered hole in head insures concentricity and *new* thread design assures a snug fit on smoothly ground tapered shank. Reamer operates free from binding or sticking due to cutting portion wearing undersize and creating negative relief. It's a product of T-J's 39 years of know-how as one of the largest manufacturers of die sinking milling cutters. Tomkins-Johnson Co., 617 North Mechanic St., Jackson, Mich.

1–Cuts replacement cost to less than half!
2–Quick change of heads saves time.
3–Wide range of sizes.
4–Head and arbor firmly locked together.
5–Easy to change heads for different metals, increases efficiency.

★Exclusive, high potential territories open to responsible manufacturers representatives. Write today!

T-J TOMKINS-JOHNSON



"Armco 17-4 PH Stainless Gives us a Better Product at Lower Cost," Machine Tool Builder says

Serrated dials like this are used on many of the machine tools built by a leading manufacturer. They accurately measure all movements on the tools. So they must be hard, resistant to rust and corrosion, and be finished to extremely close tolerances.

17-4 PH Meets Needs at Less Cost

Armco 17-4 PH Stainless Steel was selected for this critical machine tool part because its unusual combination of high strength, hardness and corrosion resistance meets service requirements and its low temperature heat treatment cuts production costs.

This is what a company official said: "We machine dial blanks from Armco 17-4 PH bars, graduate, then heat treat for hardness (875 F for 1 hour). The part is complete with no further operations and has an excellent appearance. 17-4 PH gives us a better end-product at considerably lower cost."

Results like these are typical of the advantages offered by the unusual properties of this special Armco Stainless Steel. It combines exceptionally high strength and hardness with excellent corrosion resistance and low temperature heat treatment that causes no scaling or distortion.

How About Your Products?

Consider how these advantages of Armco 17-4 PH can improve your products or cut production costs. It is available in the form of bars, wire and billets. A companion grade, Armco 17-7 PH, is supplied in sheets, strip, plates, bars and wire.

For complete information on these special Armco Stainless Steels, fill out and mail the coupon today.

ARMCO STEEL CORPORATION
2636 Curtis Street, Middletown, Ohio

Send me information on ☐ Armco 17-4 PH Stainless Steel
☐ Armco 17-7 PH Stainless Steel
We are considering it for:

Name_____

Company_____

Street_____

City_____ Zone____ State_____

ARMCO STEEL CORPORATION

2636 Curtis Street, Middletown, Ohio

Sheffield Steel Division • Armco Drainage & Metal Products, Inc. • The Armco International Corporation

ARMCO®

3—Wide range of sizes. creases efficiency.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Keep Your Eye on Aviation

Nowhere in all of industry is technical development of new production processes and of the use of new materials coming as fast as in Metalworking.

Nowhere in Metalworking is technical progress being chalked up faster than in the aviation industry. If you wish to keep up with what's new in manufacturing techniques the next few years, keep a close eye on aviation companies.

Pioneering new methods . . .

of production is not exactly new for aviation. It is easy to call to mind a series of notable processes and programs originating in the plane industry.

There is the Guerin process of rubber dies for press work, for one. The shielded-arc welding technique, which came into being on the West Coast, is another. Stretch forming of metal is still another. Controlled hydraulic forming, an East Coast development, is a fourth. The practical application of large extrusions and forgings is a fifth.

You could go on from there with a recital of other aviation "firsts," such as special machines for fabricating jet engine blades, for skin and spar milling, and for chemical milling. In no other area of Metalworking is there greater interest in production equipment that is numerically controlled; and, in the aviation industry, that means essentially small-lot production.

Getting satisfactory materials . . .

both light-weight and heat-resistant, for today's and tomorrow's planes is an ever-present problem. It has spurred on the aircraft industry to try out new uses of such metals as stainless steel, aluminum, magnesium, titanium, and now molybdenum.

There was a time when the specialized fabricating problems in aviation were solved in considerable measure by each company's pitching in and developing a workable process or piece of production equipment.

While this "lone-wolf" approach still is used and will continue to be, it lately has been admirably supplemented by a close cooperation between the Aircraft Industries Association and machine tool builders in matters of standardization and of production improvements. Washington has lent a helping hand in promoting this cooperation.

Washington, in fact, has gone much farther than that. The Air Force has provided the funds with which aviation companies have purchased new equipment that heretofore had not been production-tested and that called for daring experimentation that any single manufacturer would have hesitated to finance on his own.

With a long and impressive list . . .

of "firsts" to its credit, Detroit has traditionally been looked to as the place where new things happen in Metalworking. It still is up there at the top in its willingness to discard almost overnight the old in favor of the new. And remember that the automotive people do most if not all of their pioneering with their own money, not Uncle Sam's.

It is obvious, however, that from here on automobile makers will have to move over and share the top spot in production pioneering with the aviation companies.

To repeat, you will be a wise metalworking man if you watch closely the new production techniques of the aviation industry in the present jet age. Many of them are likely to contain practical ideas that you can apply in your own shop.

Burnham Finney EDITOR

PUNCHING

104 holes every 10 seconds *accurately*

The multiple punching of these holes must be very rapid, and their location as well as spacing must be held accurately.

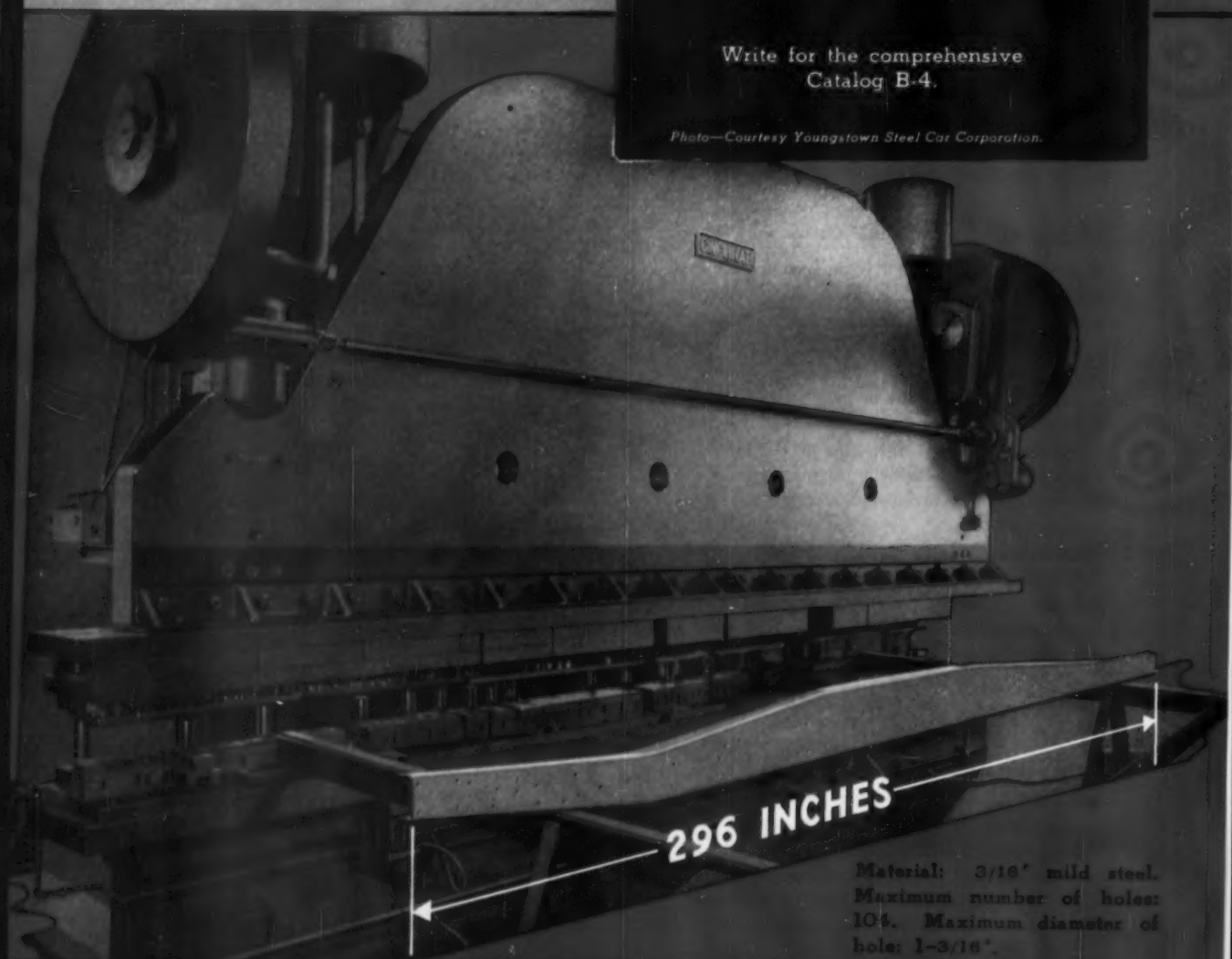
The assembly of these 24' trailer frames is smooth and economical with no costly hand fitting.

With this punching equipment, position, size and spacing of holes may be changed quickly and at low cost.

The Brake can perform many other operations as desired converting from one operation to another quickly and at low cost.

Write for the comprehensive Catalog B-4.

Photo—Courtesy Youngstown Steel Car Corporation.



Material: 3/16" mild steel. Maximum number of holes: 104. Maximum diameter of hole: 1-3/16".

CINCINNATI

THE CINCINNATI SHAPER CO.

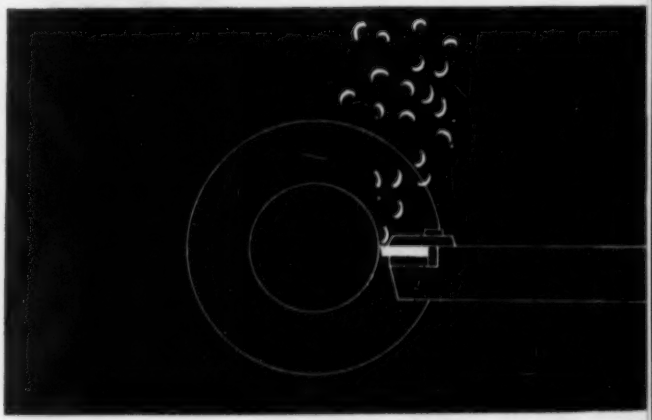
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

American Machinist

SPECIAL REPORT NUMBER 435

Seven answers to this major question:

HOW GOOD ARE CERAMIC TOOLS?



Oxide cutting tools, most often called ceramic tools, have moved faster than their most ardent supporters expected. In less than a year after the first report of Russia's work (*AM*—Nov 22 '54, p113) and the first announcement of successful tests in the United States (*AM*—Feb 28 '55, p153), ceramic tools were commercially available. By March of this year, it was possible to assemble a comprehensive roundup on the new tool materials (*AM*—Mar 12 '56, p153), even though it had to be based almost entirely on research by *producers* of ceramic tools. Six weeks ago, we carried the first report of a production application of ceramic tools—at Chevrolet—Cleveland (*AM*—Oct 22 '56, p137). Now it is at last possible to add an extensive report based on work (in both test labs and production shops) by *users* of ceramic tools. This Special Report provides new and comprehensive data to help you answer the basic question, How good are ceramic tools?

Including:

1. Ceramic tools speed gear production at Ford . . .
2. Production turning with ceramic tools at Scully-Jones . . .
3. Why oxide tools can cut faster (Armour Research Foundation) . . .
4. What we have learned about ceramics at Warner & Swasey . . .
5. Lathe tests compare carbides and ceramics at International Harvester . . .
6. Punched cards control lathe to test ceramics at Sundstrand . . .
7. Ceramic tools are evaluated at Monarch . . .

COPYRIGHT 1956 BY McGRAW-HILL PUBLISHING CO INC, 330 W 42ND STREET, N Y 36, N Y

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

1 . . Ceramic tools speed gear

First successful high-volume production application of ceramic tools is in operation at Ford Motor Co's Standard Transmission and Radiator Plant. Here's a description of the tooling setup, the speeds and feeds used, the problems involved, and the results obtained.

GEORGE H DE GROAT
Detroit editor

Cemented-oxide cutting tools . . . are combined with carbides in this Sundstrand automatic lathe for finish machining transmission sliding gears. Tools converge on the work from the top, front, and rear of the part in this high-volume production application. As many as 3000 pieces per corner are produced with the ceramic tools

After extensive testing of different types and makes of ceramics under various operating conditions and varying tool geometry, Ford Motor Co has established a high-volume production application for ceramic tools. Tests will be continued by Manufacturing Engineering Offices and various divisions, however, in an effort to learn more about these relatively new tools and to determine their suitability to other production applications. The advantages gained thus far—on the first job—are sufficient to make the outlook for wider application promising.

Finish machining the standard transmission sliding gear with ceramic tools has resulted in a 26.5% reduction in cost. This is a significant figure in light of the volume of such gears produced (over ½ million yearly). The operation includes finish turning, grooving, and facing the part on a Sundstrand automatic lathe. The Sundstrand machine was chosen for this application because it was most readily adaptable to the modifications deemed necessary by Ford engineers to meet high speed requirements. Material is SAE 5135 forged steel with a hardness of 170 to 207 Bhn and the part measures slightly less than 4-in. in dia. A stub expanding-arbor fixture with serrations holds the work.

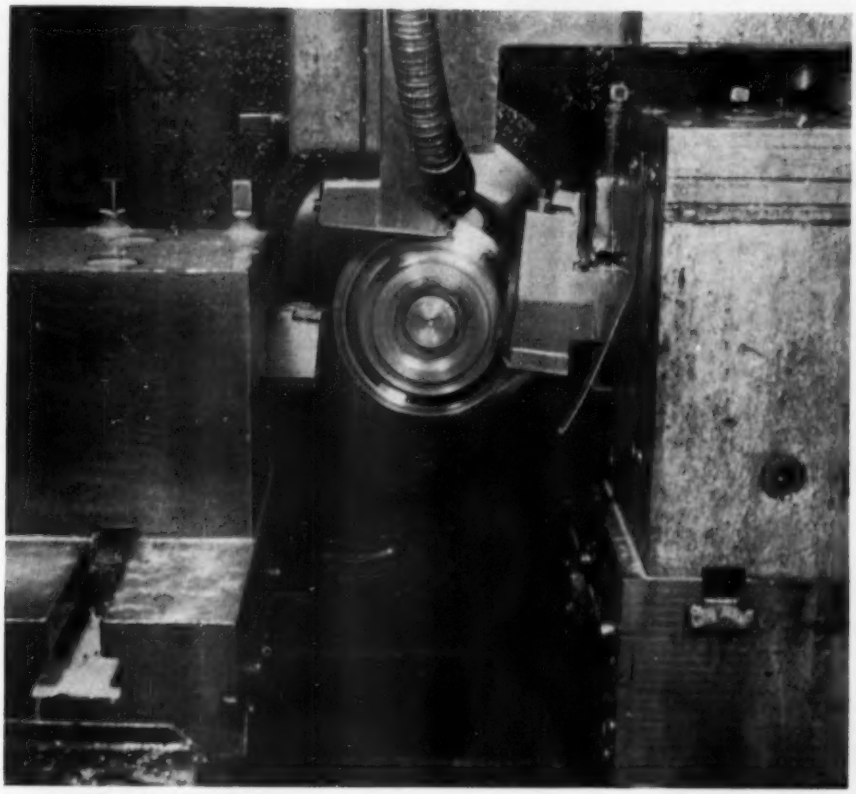
Tooling includes carbides

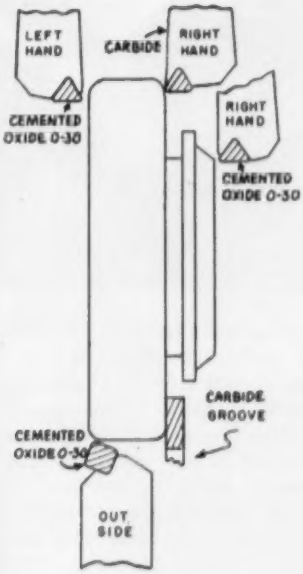
Five cutting tools are used in the Sundstrand setup, three are ceramic cemented-oxide grade 0-30 and

Surface finish . . . is consistently better with ceramic tools than with comparable carbides. Sliding gear at the left was machined with Carboloy cemented oxide 0-30 cutting tools at 1040 sfpm while carbide was employed for the other gear at 450 sfpm. Gears are first rough machined in an 8-in., 8-spindle Bullard Multimatic with conventional tools

COPYRIGHT 1956 BY McGRAW-HILL PUBLISHING CO INC, 330 W 42ND STREET, N Y 36, N Y

production at Ford





Tooling for machining . . . the sliding gears includes carbides because ceramics were not applicable in all cases. Grooving tool, for example, is too narrow to be clamped and ceramics cannot yet be cemented or brazed. The right-hand rear facing tool does not clear the work on the return stroke and the resulting drag dulls ceramic tools quickly

two are tungsten carbide. The carbide tools were not replaced with cemented oxide because of characteristics peculiar to this particular job. The carbide grooving tool, for example, is narrow and cannot be clamped adequately. As a result, this tool must be brazed or cemented, a process not yet fully successful with ceramic tools. One of the facing tools also remains carbide because it works from an auxilliary slide with no provision for clearance on the return stroke. Drag across the work on the return stroke has been found detrimental to the life of ceramic tools. Care was taken to employ a grade of carbide that could be run at the high speeds required with the ceramic tools.

The three ceramic tools include a ½-in. square cemented-oxide tool in the front holder for turning the OD and two ⅜-in. inscribed circle, triangular cemented-oxide tools in the back holder for facing cuts. All are "throw-away" inserts because of the need for expensive diamond wheels and the great care and special skills required in grinding ceramic tools.

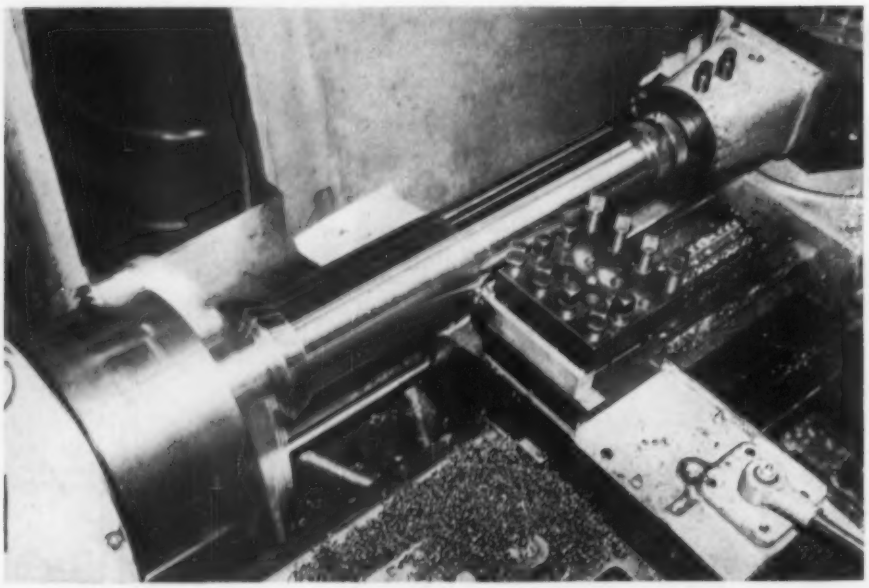
Results are good

The cemented-oxide tools are run at 1000 sfpm with a feed rate of 0.015 ipr and a 0.010-in. depth of cut. Length of cut for the OD tool is 0.850 in.; for the left-hand facing tool, 0.450 in.; and for the right-hand facing tool, 0.320 in. No coolant is necessary, and finishes run about 85 mu in. rms. Tools are usually changed at intervals of 8 to 16 hr, producing averages of 1200 to 1600 cuts per tool edge on different tools, and, by increasing the cutting speed from 450 sfpm previously used with carbide, to 1000 sfpm, the cutting cycle is greatly reduced. Cycle time with carbide was 0.250 min, now it runs about 0.180 min, contributing to a production rate increase from 118 to 146 pieces per hour.

Additional advantages include a reduction of machine idle time over a monthly period from 4.16 to

spindle Bullard Multimatic with conventional tools

1 . . Ceramic tools speed gear production at Ford



High lustre . . . obtained with ceramics is indicated by results obtained on this SAE 1045 test log, (Bhn 180-207). Although actual finish measurements may not always be better than those obtained with other tools, appearance is superior. This test was run dry on a Warner & Swasey machine with feeds identical to those used with carbide

1.87 hr and a reduction in monthly tool requirements. Of particular advantage is the rearrangement of one of the two machines previously required to other work as a result of increased production rates.

Previously, carbide tools were used in all the toolholders in this setup. Besides a production average of only 350 parts per tool index, the carbides were unable to hold size consistently. These disadvantages have been overcome with the cemented-oxide tools. The OD tool produces about 1200 parts per tool index and occasionally gets up to 3000.

Ceramics require care

Along with noticeable advantages, Ford engineers are aware of a number of problems and current limitations with ceramic tools. First of all, it is absolutely essential that all sources of vibration be removed from the machine in which they are run. This includes eliminating out of balance motors, belt slap, and improper bearings, centers and chucks. Isolation from chatter caused by adjacent tools in multiple-tool setups is also essential. Production machines and fixtures must be rigid. Construction of work spindles should be of the precision type to cut vibration. Precision bearings should be installed to insure smooth operation. It has been suggested that the same degree of improvement in machine tools that was made when industry went from HSS to carbide will probably be necessary in the transition from carbide to ceramics.

Intimate and uniform contact between the ceramic tool and its supporting surface is essential. Holders must rigidly support the tool. Clamps must also be flat and clamping pressure exerted uniformly over the whole surface covered. A loose curl is desirable for best tool life and to achieve this, a mechanical chip breaker can be positioned to suit.

It is also considered advisable to have the chip breaker cover as much of the tool as possible to prevent chips from striking the edge of the tool. Although this is not done on the production setup, it has been found useful in laboratory tests as a means of eliminating breakage.

In the recent past, lack of uniformity from batch to batch of ceramic tool materials was a great deterrent to their widespread use. Although this problem still exists to some extent it has improved considerably and will probably improve still more as manufacturing techniques improve. It is essential that tool materials eventually become consistently uniform for extensive use of ceramics.

Although the initial cost is generally higher for ceramic tools than for carbides at present, reduction in machine cycle time more than offsets the added expense. And, in addition, higher machine productivity and reductions in machine requirements, floor space, and direct labor costs produce further savings.

General conclusions regarding ceramic tools based on this production application include:

1. The advantages of cemented oxide tools are best demonstrated at speeds two or more times greater than those used with carbide
2. Feeds should be as fine as those used with carbide
3. Depth of cut should be limited to about 0.100 in. at this time
4. The cut should be uninterrupted
5. Finishes obtained are very good
6. Grinding is more critical than with carbide, therefore disposable tools are recommended
7. All cutting edges must be honed
8. Because of the characteristics of ceramic materials, coolants are not necessary

Several other applications have been under investigation and will soon reach production.

CERAMIC TOOLS . . .

2 . . Production turn with ceramic tools

Skipping lab research, Scully-Jones has put ceramics into production and kept test records on these runs. Here are the results

JOSEPH KOSINSKI, works manager, CHESTER HIERA, methods supervisor and EDWARD JABLONSKI, toolroom supervisor SCULLY-JONES & CO, CHICAGO

Bearing sleeves for milling-machine arbors are rough turned with ceramic bits from previously cut-off lengths of cold-drawn AISI C-1144 steel tubing on a regular production basis. This has been standard practice for more than six months at the Scully-Jones plant in Chicago.

In addition, a number of other turning operations will be converted to ceramic tooling as rapidly as we can be assured of an adequate, regular supply of good-quality bits of proper shape.

This development does not mean that we have solved all of the problems involved in the correct application of ceramic toolbits to machining operations. In common with virtually every other plant testing these bits, we still have a lot to learn about their proper application.

But our successes to date outweigh our failures and prove we have been justified in our expenditures for thorough trials of the new ceramic cutting bit materials. A good share of our success has been due, we are sure, to the fact that we started testing the new toolbits on production operations at an early date, rather than running tests on barstock logs in our research department.

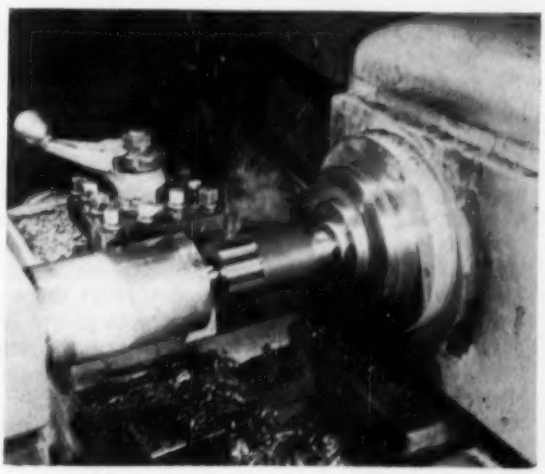
Test cuts taken on production parts in engine and turret lathes during the past 18 months have proven to our satisfaction that:

1. Modern, rigid, carefully maintained machine tools are essential to successful application of ceramic bits to metalcutting operations. Any vibration or slippage in the spindle-drive train or clutches, or any looseness in spindle, tailstock, and slide bearings, is sure to result in rapid breakdown of cutting edges.

2. Toolholders, and the blocks or turrets in which they are mounted, must provide rigid support for the ceramic bits. Overhang must be held to a minimum for best results.

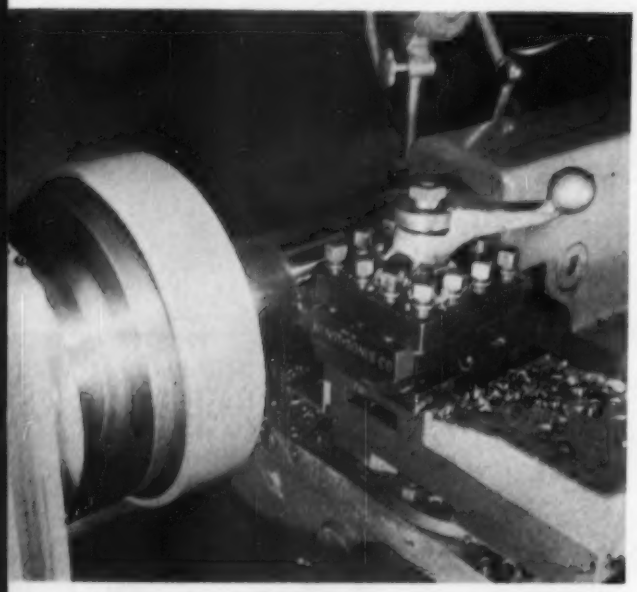
3. Cutting-edge geometry is important. To date, our best results have been obtained with clamp holders like those employed for throwaway carbide

20-in. engine lathe
(Monarch) is run at top speed of 1750 rpm when turning 2¼-in. OD steel bearing sleeves with ceramic toolbits. Tight clutches and finely-adjusted bearings are essential to eliminate vibration and chatter during these high-speed cuts

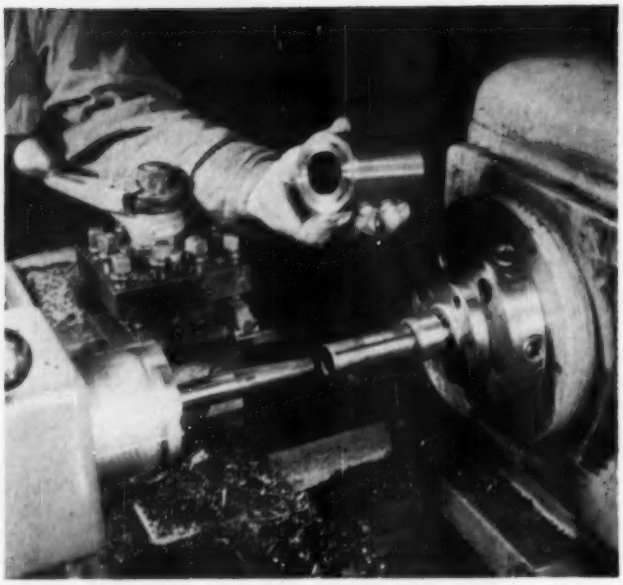


Major problem . . .
when turning at high speeds with ceramic toolbits is high-velocity spray of fine, hot chips which must be confined within guards to insure safety of nearby workers and to promote good housekeeping. Guards were removed for this photograph

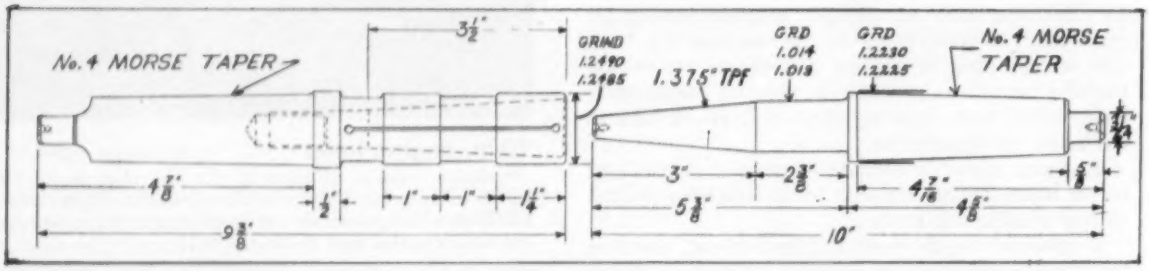
2 . . Production turn with ceramic tools



Heavy-shank toolholders . . .
that hold the bit at –5° back and side rake angles (with 5° clearance angles) now appear to work best when using ceramic bits. Side cutting-edge angle should be 10 to 15° to avoid shock loading of cutting edge at start of cut



Rapid loading . . .
and unloading of work is essential to take full advantage of cost-cutting potential of ceramic toolbits. Novel mandrel expanded by tapered plug carried in live center of tailstock was developed for turning bearing sleeves



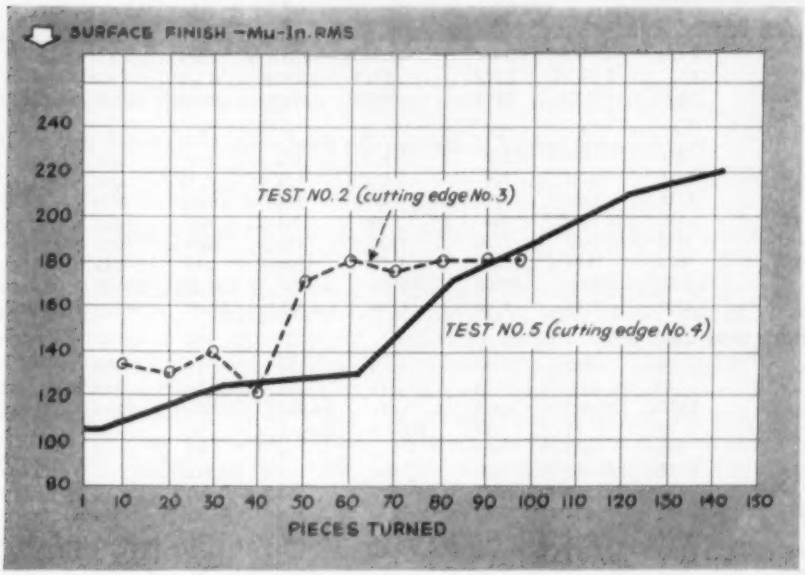
Expanding mandrels . . .
for 1¼- and 2¼-in. ID sleeves have collet adapters for use in holding 1½- and 2½-in. ID sleeves. Mandrel is fitted in spindle nose of lathe, operating plug is centered in tailstock spindle and is entered into open end of mandrel to expand it against bore of work. Mandrel is made from AISI 52100 steel and plug is made from Graphmo steel. Both are hardened to 58 to 60 Rc

bits, and with tungsten-carbide shims under the ceramic bits to support them against cutting pressures. Adjustable chipbreakers on these holders must be positioned to produce well-broken, short chips, and must be clamped tightly so they cannot shift during the cut. Most of our ceramic-bit turning operations today employ Carboloy Type CSBR-16 or Wendt-Sonis Type WBR-85 holders that support the bits at 15° side and end cutting edge angles, and at –5° back and side rake angles. These tool angles have proven especially suitable for turning bearing sleeves.

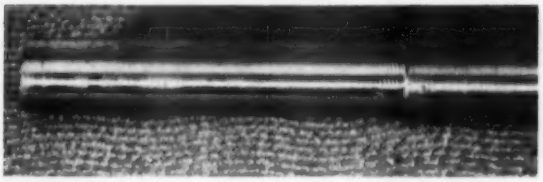
4. Cutting pressures generally are higher than when turning with carbide bits, because higher speeds are used, so the work must be supported properly to avoid chatter and rapid damage to the cutting edge. Long shafts of relatively small diameter are difficult, if not impossible, to turn at high speeds with ceramic bits unless supported against springing away from the tool by some form of follower rest.

5. Surface finish developed by a given ceramic cutting edge can vary considerably even when cutting action is satisfactory (see chart), but a noticeable change in the finish produced during a cut, or on two successive parts, generally is the first indication that the ceramic bit is developing a wear land and may fail soon. Finishes obtained when making

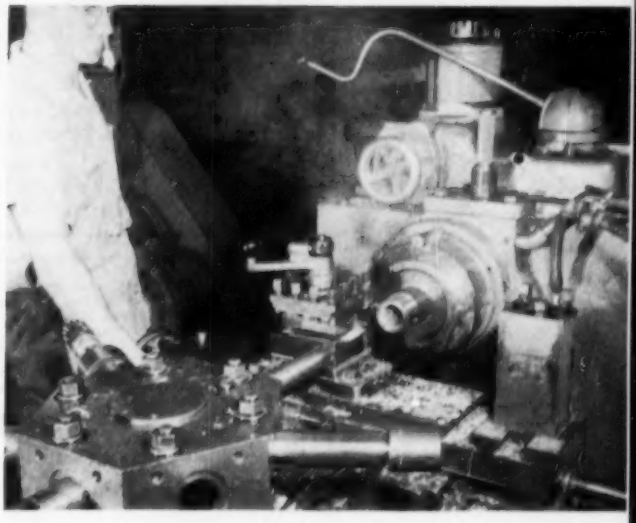
CERAMIC TOOLS . . .



Wear rate . . .
of cutting edges on ceramic toolbits varies widely, but quick change generally means breakdown is near. Quality-control inspections of surface finish produced at regular intervals during two test runs are charted above



Results . . .
of attempt to turn 21 in. long, 1½-in. OD steel milling machine arbor at 1750 rpm and 0.0105-ipr feed with ceramic toolbit is shown above. After cutting well for first 6 in. of length from the tailstock-supported end, the bit wore rapidly and cut chatter shown because unsupported shaft was not stiff enough to resist tool pressure



Ceramic toolbit . . .
in this setup in a No. 5 Warner & Swasey turret lathe turns the OD of a tool-driver collar being machined from 2.756-in. OD, 1,620-in. ID AISI 4620 steel tubing. Ceramic cut takes 0.08 sec; carbide tool took 0.134 sec

the test runs listed in the accompanying table ranged from 80 to 250 mu in. rms.

6. Skilled machine operators are essential to the success of present-day applications of ceramic toolbits to production operations. The best of these bits can be damaged beyond use if not entered into the cut slowly to avoid shock loading. The machine must not be loaded to the extent that the spindle slows down as the cut proceeds. These precautions do not mean that fairly heavy cuts cannot be taken. We have successfully turned steel parts at 1000 to 1100 fpm with approx. 0.010-ipr feed with ¼- to ⅜-in. depth of cut. Thicker bits should be used for the heavier cuts.

7. There is considerable variation today in the quality and metalcutting ability of ceramic bits obtainable. Even bits obtained from the same supplier have been found to vary materially in quality from lot to lot, and sometimes even within the same lot. This condition is improving gradually, as makers of ceramic bits improve their materials and their production procedures.

8. While we have proven by test that soluble-oil cutting fluids can be used with ceramic toolbits when turning steel at high speed, we still are making all such cuts dry. High-speed rotation of the lathe spindle and workpiece causes the cutting fluid to spray all over the shop unless the work area is enclosed.

2 . . Production turn with ceramic tools

PRODUCTION TEST RESULTS IN TURNING BEARING SLEEVES

TEST NO.	1	2	3	4	5	6	7	8
Part OD, in.	2 1/4	2 1/4	2 1/4	2 1/4	2 1/2	2 3/4	2 3/4	2 7/8
Part length, in.	4	3 13/16	3 3/4	3 3/4	3 3/4	4 1/8	4 1/8	4 1/4
Part hardness, Rc	20-25	20-25	20-25	20-25	20-25	20-25	20-25	20-25
TYPE OF CERAMIC	A	B	C	D	B	E	A	B
Size of sq bit, in.	3/4	1/2	1/2	1/2	1/2	1/2	3/4	1/2
Thickness, in.	3/16	3/16	1/8	1/4	1/8	3/16	3/16	1/8
Nose radius, in.	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16
Hone cutting edges?	Yes	No	Yes	No	Yes	Yes	Yes	No
Spindle speed, rpm	1750	1750	1750	1750	1750	1200	1200	1535
Cutting speed, sfpm	1070	1070	1070	1070	1180	864	864	1165
Feed rate, ipr	0.0085	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105	0.0105
Depth of cut, in.	1/16	1/16	1/16	1/16	0.055	0.100	0.100	1/16
RESULTS PER CUTTING EDGE USED:								
1. No. pieces	20	150	23	3	111	18	28	9
Inches of fed	80	572	86	11	416	74	114	38
Feet of chip	5,572	32,089	4,839	631	25,946	5,091	7,815	2,748
2. No. pieces	35	96	27	Note 1	Note 2	19	x	49
Inches of feed	140	366	101	x	x	78	x	208
Feet of chip	9,750	20,533	631	x	x	5,374	x	14,959
3. No. pieces	23	219	23	x	138	20	x	Note 2
Inches of feed	92	835	86	x	517	82	x	x
Feet of chip	6,407	46,844	4,839	x	32,257	5,657	x	x
4. No. pieces	49	54	19	x	142	5	x	164
Inches of feed	196	Note 3	71	x	532	21	x	697
Feet of chip	13,650	x	3,997	x	33,192	1,414	x	50,068
5. No. pieces	52	x	25	x	107	8	x	x
Inches of feed	210	x	94	x	Note 3	33	x	x
Feet of chip	14,626	x	5,259	x	x	2,263	x	x
6. No. pieces	x	x	22	x	x	x	x	x
Inches of feed	x	x	83	x	x	x	x	x
Feet of chip	x	x	4,628	x	x	x	x	x
7. No. pieces	x	x	19	x	x	x	x	x
Inches of feed	x	x	71	x	x	x	x	x
Feet of chip	x	x	3,997	x	x	x	x	x
8. No. pieces	x	x	22	x	x	x	x	x
Inches of feed	x	x	83	x	x	x	x	x
Feet of chip	x	x	4,628	x	x	x	x	x

Until ceramic toolbits were tested for this turning operation, these sleeves were turned with Carboloy Grade 350 carbide-tipped tools with 0.060 to 0.070-in. ledge-type chipbreakers, 1/32-in. nose radius, 0° rake and side cutting edge angles, and 7° end cutting-edge angles. Turning cuts were taken at 530 sfpm with 0.015-ipr feed, and power input averaged 7 hp. Pieces per tool grind averaged 125 to 150.

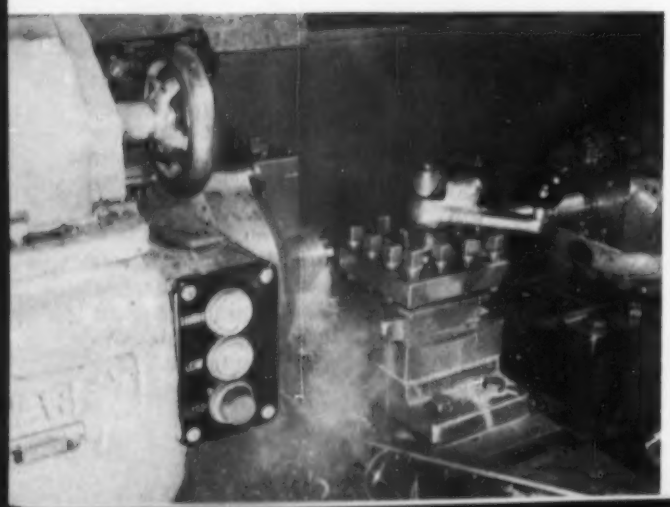
Data tabulated above for the various test cuts were rounded out to whole numbers after calculations were completed.

Ceramic bits generally were run past normal wear limits to determine ultimate life to be expected of these materials, so most cutting edges were damaged to the extent that edges on the other side could not then be used.

Note 1. This ceramic material broke down rapidly, averaging 0.010-in. increase in wear land for each piece turned, so it was difficult to maintain size. When set up to use the second cutting edge of the bit, it was found necessary to take two cuts on each part, in order to remove taper left by the first turning cuts.

Note 2. In these cases, cutting edge of the ceramic bit cracked during the first pass taken because of failure to clean the toolholder sufficiently to remove a small steel chip accidentally entered between the tungsten carbide shim and the bottom face of the ceramic bit.

Note 3. In these cases the job order was completed before the cutting edge of the ceramic bit was worn beyond economic use. In each case, the cutting edge could have been employed to turn additional pieces.



Turning OD . . .
of tool-driver collar in turret lathe is done at 1316 rpm with 0.012-ipr feed and 0.147-in. depth of cut, when using ceramic bit. Production averages 56 to 57 pieces per cutting edge. When carbide bit was used at 548 rpm with 0.017-ipr feed, the same tool life was experienced. Cut is 1 3/16 in. long, 2.756-in. OD

3 . . Why oxide tools can cut faster

Differences in the tendency of chips to weld to the tool tip are the major reason that oxide tools can operate at higher temperatures

DR ARTHUR G METCALFE, senior metallurgist,
ARMOUR RESEARCH FOUNDATION, ILLINOIS INSTITUTE OF TECHNOLOGY, CHICAGO

In the development of cutting tools, the major jump in performance occurred at the introduction of the cemented carbides. This increase was so spectacular that it could not be realized in all cases on the machines available in the 1930's, and this led to a very slow adoption of the new material.

The increase in cutting speed may be connected with the increased resistance to softening as the amount of carbide is increased. This relationship between cutting speed, the amount of carbide, and the hot hardness is the most marked characteristic of these materials. Other changes occur as the amount of carbide is increased. The compressive strength increases, particularly as the amount of bond becomes very small. The bonding strength and the impact strength decrease, however.

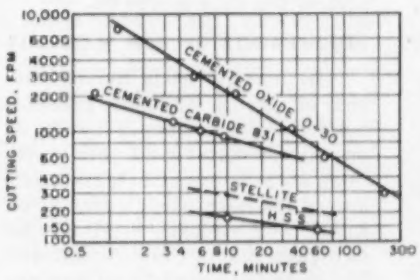
This trend in properties favors, principally, an increase in the speed of cutting. On the other hand, better machine tools have allowed the more brittle cemented carbides to replace high-speed steel in applications formerly considered to be impossible. It is proposed to consider these new tool materials principally from the point of view of speed of cutting, with less attention being paid to other requirements of the tool. Previous experience shows that better machine tools and better application of the tool can utilize weaker and more brittle materials.

The reduced tendency to soften at high temperatures as the amount of carbide is increased, suggests that one solution to the tool material problem would be to remove the soft, ductile bond. There are two reasons why this approach fails. One is the well-known increase in brittleness as the cobalt content of a cemented carbide is decreased. The other concerns the mechanism of wear. Wear may be caused by abrasive particles, such as scale on the surface and nitride or carbide "hard spots" in the metal, scouring the surface of the tool material. This abrasion is believed to be responsible for some of the flank and nose wear of the tool.

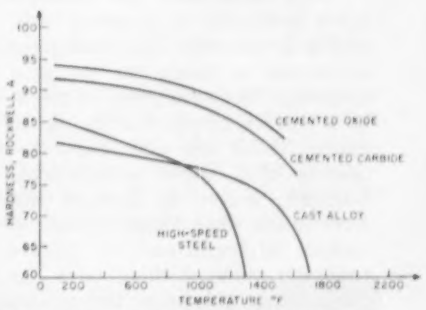
In the other mechanism of wear, the two metals rubbing past each other weld together. This welding is aided by the high pressures and high temperatures reached. Further movement of the metals past each other requires breaking of the weld joints with particles of the tool material being pulled out by the chip. In the same way that a lower melting point metal aids in making a brazed joint, so the formation of a melt between the steel chip and the tool material aids this form of wear (cratering).

Typical cratering is accompanied by a welding-on of steel particles. Sections through such welded-on particles show that complete solution of tungsten carbide in the steel occurs. Dr E M Trent has shown that preferential solution of tungsten carbide occurs because iron and tungsten carbide can form a melt of 2400 F whereas titanium carbide does not fuse with iron until somewhat higher temperatures. In a tungsten carbide without bond, this cratering continues to occur, so that reducing the bond would not represent a useful change.

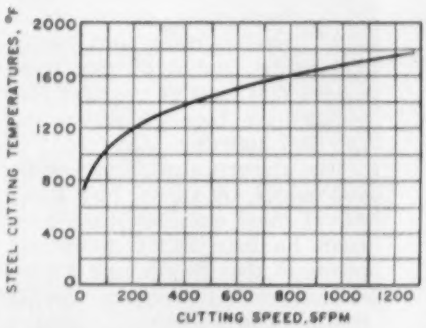
It is known from calorimetric studies that less than 5% of the energy expended in cutting remains in the metal as strain energy, the remainder being converted to heat. Using the work and tool materials as a thermocouple, contact temperatures as high as 1800 F have been measured. On the other hand, Bowden's fundamental work on friction has shown that seizure or "welding-on" is accompanied by temperatures which reach the melting point of the lowest melting-point phase. These high temperatures occur locally and are of a duration of less than



Relative performance of tool materials



Relative temperature resistance of tool materials



Cutting temperature related to cutting speed

3 . . Why oxide tools can cut faster

one-thousandth of a second. The usual temperature measuring equipment does not respond to such short bursts, so that only the sustained temperature is recorded. Hence, an average temperature of 1800 F may be accompanied by short time surges to 2400 F. These surges cause local fusion of the chip and the tool material with the tearing out of a small piece of the tool as the chip moves on.

REQUIREMENTS OF NEW MATERIALS

New tool materials should consist of grains of hard particles bonded to themselves or by use of an intermediate bond. For optimum abrasion resistance, the grain size of the hard particle should be small. The strength need not be as high as that of conventional materials if frictional forces are reduced by decreased welding-on.

These conditions are encountered primarily in finishing cuts, and it is precisely here that most advantage is found for the new materials. The hard particles might be a silicide, nitride, boride, or an oxide. These are chemical compounds of a metal with silicon, nitrogen, boron, or oxygen and have much resemblance to silicon carbide or boron carbide. Unfortunately, none of them have the hardness of silicon or boron carbides. The silicides are all softer than tungsten carbide, and only one or two of the nitrides exceed its hardness value. On the other hand, there are many hard borides and oxides, and it is from these groups that most of the hard materials have been picked for the new tool materials.

The properties of some borides and oxides are shown in a table. All of these materials have adequate hardness and high melting points so that they would not be expected to soften appreciably on heating. The tendency of the hard particle to weld on to a steel chip rubbing over it can be estimated from the lowest temperature at which a melt forms between iron and the hard particle. In the case of alumina, this temperature is the melting point of iron (2800 F) and even here there is no bonding of the iron and alumina. This lack of any tendency for welding to occur means less heating and must be responsible for the fact that ceramic tools run cold.

On the other hand, iron and tungsten carbide form a melt at 2400 F which may solidify to form a strongly brazed joint; further movement of the steel chip tears out some carbide to form a crater. The higher the "welding-on" temperature, the more heat that can be tolerated in cutting before this occurs, assuming that the strength and hardness are retained. Measurements of these temperatures have been made at Armour and show that chromium, titanium, and zirconium borides form melts with iron below 2250 F, whereas aluminum boride does not form a melt until 2600 F. The temperatures for molybdenum boride have not been determined.

The similarity of these temperatures for titanium boride and tungsten carbide is reflected in the similarity of cutting test results on a carbide and a titanium boride composition run at the Thompson Products Research Laboratory (*AM*—Mar 12 '56, p159). Direct relation to this temperature would not be expected because other properties such as hot hardness and compressive strength must be considered. The importance of this factor is illustrated by titanium which reacts readily with the boride, so that titanium cannot be machined. A composition based on molybdenum boride has been developed during Navy-sponsored research at the American Electro Metal Corporation (*AM*—Mar 12 '56, p158). Machining tests at many laboratories have shown that this material is not one which will permit any marked increase in the cutting speed.

PROPERTIES OF SOME TOOL MATERIALS

Hard Particle	Density, g/cc	Hardness, Vhn	Melting Point, °F
TiB_2	4.4	4200	5300
ZrB_2	6.2	3600	5400
AlB_{12}	2.6	3800	——
Al_2O_3	3.9	3000	3700
WC	15.7	2400	5100
TiC	4.9	3000	5700

WELDING-ON TEMPERATURE BETWEEN STEEL AND HARD PARTICLES

Particle	Welding-on Temperature °F
Chromium Boride	2250
Titanium Boride	2250
Zirconium Boride	2250
Tungsten Carbide	2400
Titanium Carbide	2500
Aluminum Boride	2600
Alumina	over 2800

NEW MATERIALS COMPARED

The tool materials based on borides appear to offer few advantages compared with carbides. Possibly further development work may show that aluminum boride can be used as the base of an improved tool material.

The oxide-base tool materials offer a possibility of increasing speeds many times for the reasons discussed earlier. The bending strength, compressive strength, and the impact strength are below those of the cemented carbides. For example, the impact of the high-speed chips on the cutting edge of a ceramic tool may cause chipping. Some of this lower strength can be tolerated at the moment, but until new machines and techniques can be developed, these low strengths will limit the use of ceramic tools.

Undoubtedly, improvements in these materials are possible. A Russian publication of 1952 stressed the need for the minimum possible porosity in ceramic tools, in agreement with earlier work in England. Recently, one American company has gone to the more expensive process of hot pressing in order to achieve full density. The elimination of the last traces of porosity in this material is difficult, but its achievement will widen the field of use of ceramic tools.

The brittleness of ceramic tools may be reduced by other factors yet to be discovered. The results of this brittleness are cracking under changing conditions, edge cracking, and so on. Some of these may be reduced by better machines and new techniques. An interesting example of this is the finishing of the cutting tool edge to a 5° negative angle over a few thousandths of an inch.

4 . . How should you use ceramics?

A summary of the things learned, some of them surprising, in a test program that has included both laboratory studies and production use in the Gradall Div

ROBERT T HOOK, chief metallurgist, THE WARNER & SWASEY CO, CLEVELAND

Clamped-on tools appear to be a necessity because of the present price, performance, and brazing qualities of ceramic tools. Because the cutters tend to shatter rather quickly at the beginning of experiments, it is desirable to be able to change tips by rotating in a clamped-on tool. Some vendors state that their material can be brazed, but it is best to stay with the clamped-on tool.

The current double-negative –5° tools offer four cutting edges on a rectangle, and eight on a square —if you don't shatter the side opposite the cutting edge.

With clamped-on tools, carbide shims are a must for support. This carbide shim serves to remove any deflection that might occur in the anvil supporting the ceramic and also serves as a good heat conductor. In some experiments this carbide has saved the toolholder, for when the ceramic has failed the carbide shim will cut for a few seconds, permitting the operator time to cut off the feed.

The carbide backing helps but is not necessarily required. On some of the more rigid holders, we have been using carbide backing with exceptionally good results.

Rigid clamping of the ceramic in the toolholder is a must to prevent chipping of the future cutting edges opposite the side cutting edge. Such chipping results from the vibration that occurs under the clamp and from the fact that the toolholder expands on heating.

Carbide chipbreakers held mechanically and simultaneously by brazing appear to be best. Do not count on brazing alone to hold the chipbreaker as faulty brazing or the heat from the chip flow will cause the braze to soften and loosen the chipbreaker and consequently the cutting tip itself. This happens primarily where the chipbreaker also acts as part of the clamp.

Speed ranges from 400 to 1400 sfpm appear to be the average tried by many people. On some materials, cutting speeds can go as high as 3000 sfpm, but ceramic tool life is affected by cutting speed just as carbide tool life is. The depth of cut can range from a light finishing cut of 0.010 up to as much as 0.300-in. Feeds that work out very well in practice range from light finishing feeds to as much as 0.027 ipr.

Examples of cutting speeds and feeds tried in our laboratory and shop with good results:

1. 4150 hot-rolled annealed (197 Bhn) skim cut with carbide, 850 sfpm, 0.012 ipr, 0.300 ipr, 0.300-in. depth of cut.

2. C-1045 hot-rolled annealed (170 Bhn), 1600 sfpm, 0.012 ipr, 0.100-in. depth of cut (very good results).

3. AISI C-1015 cold-drawn mechanical seamless steel tubing 4¼-in. dia. by 78½-in. long. This is a production operation in our Gradall division and is shown in the illustration with data on the cutting conditions. Most tests have been dry cutting but this operation is now run with coolant.

Chipbreaker settings should be a minimum of ⅛ in. from the cutting edge. From our own experience, "rule of thumb" might possibly call for settings from 10 to 20 times the feed rate. The chipbreaker should be set at an angle not quite as great as the side cutting-edge angle or lead angle, so that the chip will be curled and allowed to hit into the unused portion of the ceramic.

Coolants seem more suitable for use with ceramics than with the carbides. We have noted this with a great deal of surprise in our laboratory. Coolant helps to control the chip by taking it down into the pan rather than letting it fly around the room. In experimental production jobs, we have had good re-

Rough turning . . .
AISI C-1015 seamless steel tubing in production at the Gradall Div of Warner & Swasey. The Stupalox cutter is cutting at 797 sfpm, with a 0.015-ipr feed and a ⅛-in. depth of cut. For finishing cuts, the speed is the same but depth of cut is reduced to 0.022 in. and the feed is increased to 0.022 ipr

4 . . How should you use ceramics?

sults with intermittent application of coolant—first allowing the ceramic cutting tool to get hot, then applying the coolant—water, or soda water and emulsified oil. We found no tendency for cracking as might have been the case with intermittent application of coolant to a heated carbide cutting tip.

Horsepower requirements for ceramic cutting under comparable conditions to carbides appear to be only 80% of the horsepower requirements for carbides, apparently because of the lower coefficient of friction. This remains to be checked further.

Ceramics may be prepared with the same technique used for grinding carbides. The use of a diamond grinding wheel of 220 grit is recommended to prevent cracking during the grinding operation. The ceramics in general grind much easier than the carbides. Care must be exercised in attempting to grind small areas because the rate of grinding is extremely fast, and when the operator is not acquainted with this reaction he will over-grind, especially in attempting to grind small radii and flats.

Problems with ceramics

In the early stages of ceramic tools, results were inconsistent in terms of tool life. We have seen cutting with ceramics proceed from about 72 cu in. of metal removed at 1300 sfpm to as high as 1080 cu in. under similar feeds and speeds. Therefore, we can say that an improvement is showing up now in the consistency of tool life as well as in the ability of the present ceramics to remove metal at high speeds.

We will all have to look forward to improvement in impact qualities. Reports from the iron curtain countries indicate that impact improvements have already been gained through a slight drop in hardness and as a result they are able to take interrupted cuts.

Mutual agreement by the manufacturers of ceramics as to the size and style of ceramic tips and their applicability for use in the clamped-on tools now available would make their use easier. At the present time each size of the so-called precision-ground throwaway tips appears to require a different type of holder.

Test observations

All turning work with ceramic tools has been done with 5° negative toolholders, using a carbide shim and carbide backing with a brazed carbide chipbreaker clamped at the top. Cutter tips are ⅜ x ¾ x ⅞ in., with nose radii of 1/32 in. max.

So far we have found that the minimum distance from the cutting edge to the chipbreaker closer than ⅛ in. from the cutting edge flakes the tool, and in most cases breaks the nose radius of the ceramic. For rule of thumb, the setting of the chipbreaker should be from 10 to 20 times the feed rate for 1000 sfpm or higher.

Ceramic tools can be run with coolant. We find that coolant helps the chip-control problem in that it weighs the chips sufficiently so that they drop into the pan of the machine rather than stream out and around the machine in every direction.

Ceramic tools can be used as a facing tool. An example done in our shop with good results was the facing of a 1045 pentagon bar from 13-9/16-in. dia as a rough forging, ¼-in. width of cut, 303 rpm, and 0.011 ipr feed.

The nose of the ceramic tools should have a 1/32-in. radius for the best results. Sharp-edge nose radii will cut, but the finish is undesirable. Nose radii larger than the 1/32-in. appear to give too much chatter.

Caution must be used in turning so that no burrs from previous operations are left, at both the start and finish of cut. An edge with a burr tends to flake the tool. Probably a chamfer on the side cutting edge where the burr is likely to contact the ceramic might overcome this tendency.

We have found that if we finish a cut and then immediately start another cut, the ceramic tool holds up much better than if we allow a cycle time between cuts. In the present clamped-on toolholders the ceramic bit is cool after a cut, but if the tool is permitted to be idle for a period of time all of the heat in the toolholder and the carbide shim transmits itself back into the ceramic tool.

We have noticed that the heat of the work differs on a rough cut as compared with a finish cut. On a 3/16-in. depth of cut, the work is cold while on a 0.045-in. finishing cut the work is warm. We have no explanation as yet, but further studies may reveal the answer.

Eliminating chatter

Rigid positioning of the tailstock center seems to be the determining factor in eliminating taper and chatter. Unless this end of the work is rigidly held, the chatter will show up in the finish of the work much more than with carbides.

For the time being the method of necking before turning so that the ceramic will not dwell at the finish of a cut will prevent abrading of the tool.

To cut down the vibration at higher speeds, the driving dogs must be accurately made for balance, possibly of light-weight material such as aluminum. We have spent considerable time in positioning the driving dogs on our experiments because this vibration shows up in the finish on the work. Vibration of the machine itself must be eliminated at all speeds. Continued vibration results in poor finish of the work, and if severe enough can break the nose radius of the ceramic.

Chipbreakers must be set for various speed ranges. At 1500 sfpm one tool will produce a short brittle chip. The same tool at 1000 sfpm will produce a bale of hay. More studies of this will have to be made.

Lead angles or side cutting-edge angles of 5° or greater should be instituted wherever possible to minimize shock upon entry into the work. It is our opinion that as the lead angles approach zero the nose radius becomes more critical and that it should not exceed 1/32-in. radius.

CERAMIC TOOLS . . .

5..Tests compare carbides and ceramics

Six ceramics are compared with standard steel-cutting carbides and high-titanium carbide. At speeds above 800 sfpm, two of the ceramic tools stand out in resistance to tool wear, but one of these has a tendency to chip

B D SMITH, general supervisor, Mechanical Engineering Research
and F L HELMEL, mechanical research engineer, Manufacturing Research Dept
INTERNATIONAL HARVESTER CO, CHICAGO

Accurately maintained for peak performance . . .

during turning tests, this 16-in. heavy-duty engine lathe is equipped with a 15-hp drive capable of turning the spindle at any desired speed from 0 to 1500 rpm. At instrument panel (left) speed, revolutions, and power consumption can be measured and recorded

To help International Harvester Co's 21 manufacturing plants in the U S and Canada keep abreast of recent developments in cutting tool materials, the company's Manufacturing Research Dept recently has completed a series of tests in which six different makes of ceramic toolbits, and a new high-titanium carbide were compared with bits made from two steel-cutting grades of tungsten carbide.

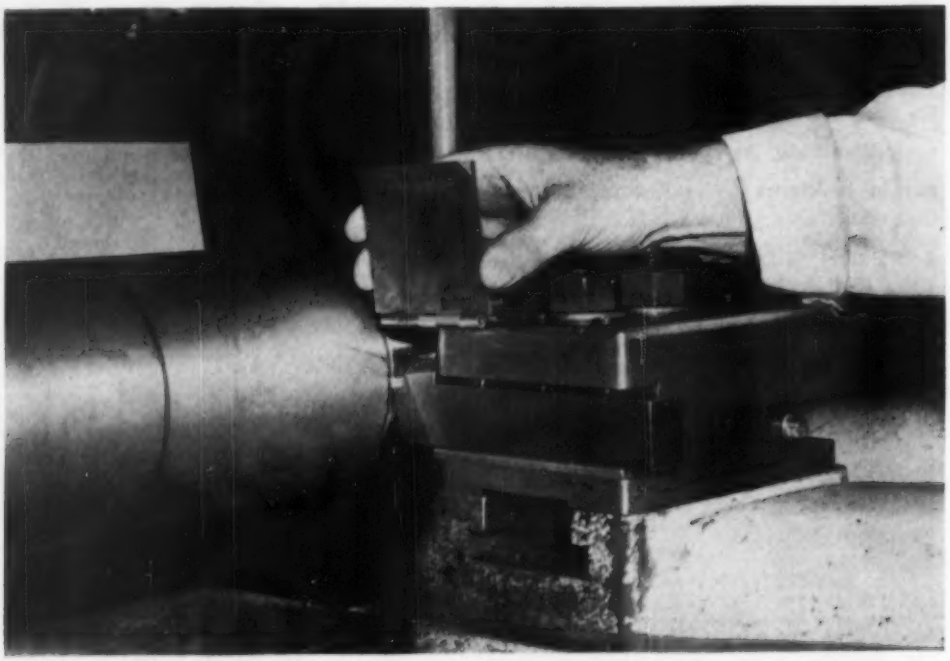
These test runs are the latest in a series of tests made during the past year with ceramics tried out as soon as sample bits could be obtained. Results during the latest trials (see chart and table) show that most of the ceramic materials now available are of more consistent quality than those tested earlier.

All tests were run in a standard 16-in. LeBlond heavy-duty engine lathe equipped with a 15-hp adjustable-speed drive developing spindle speeds from 0 to 1500 rpm. The lathe is connected electrically with a test panel equipped with instruments that record elapsed time and total revolutions for each cut, as well as actual cutting speed in rpm and power used.

Test cuts were made on 6.5-in. OD, 36-in. long logs of AISI C-1050 hot-rolled steel, with 180 to 190 Bhn hardness.

Toolbits for Tools 1, 2, 3, 4, 6, 7, 8 and 9 were ½-in. square and 3/16 in. thick, with a 1/16-in. radius on each corner. Bits for Tool 5 were triangular,

5 . . Tests compare carbides and ceramics



Hinged steel chip deflector . . .
bolted to top of turret toolpost surrounds tool in cutting area to prevent rapidly-moving, hot chips from flying all over the shop during a high-speed turning operation. Deflector lifts as chips pile up around tool, to permit them to drop away into lathe bed. Size can be varied to suit the job

HOW CUTTING LIFE OF CERAMICS VARY WITH SPEED
(Stock removal in cubic in. per 0.001-in. wear land)

Tool Number	Toolbit Material	Cutting Speed, sfpm				
		1200	1000	800	600	400
1	Type C-8 Carbide (Control Tool)	0.167	0.784	1.85	2.47	3.78
2	Type C-6 Carbide (Control Tool)	0.105	0.476	1.24	2.33	5.21
3	Ceramic A	0.032	0.017	0.082	0.91	2.30
4	Ceramic B	0.322	0.539	2.16	3.17	4.57
5	Ceramic C	3.93	3.58	6.42	7.16	10.92
6	Ceramic D	8.71	9.29	10.02	13.40	17.22
7	Ceramic E	0.745	0.894	1.28	2.87	9.41
8	High-Titanium Tungsten Carbide	1.22	1.23	5.45	5.71	13.72
9	Ceramic F	0.164	0.843	1.45	3.48	5.27

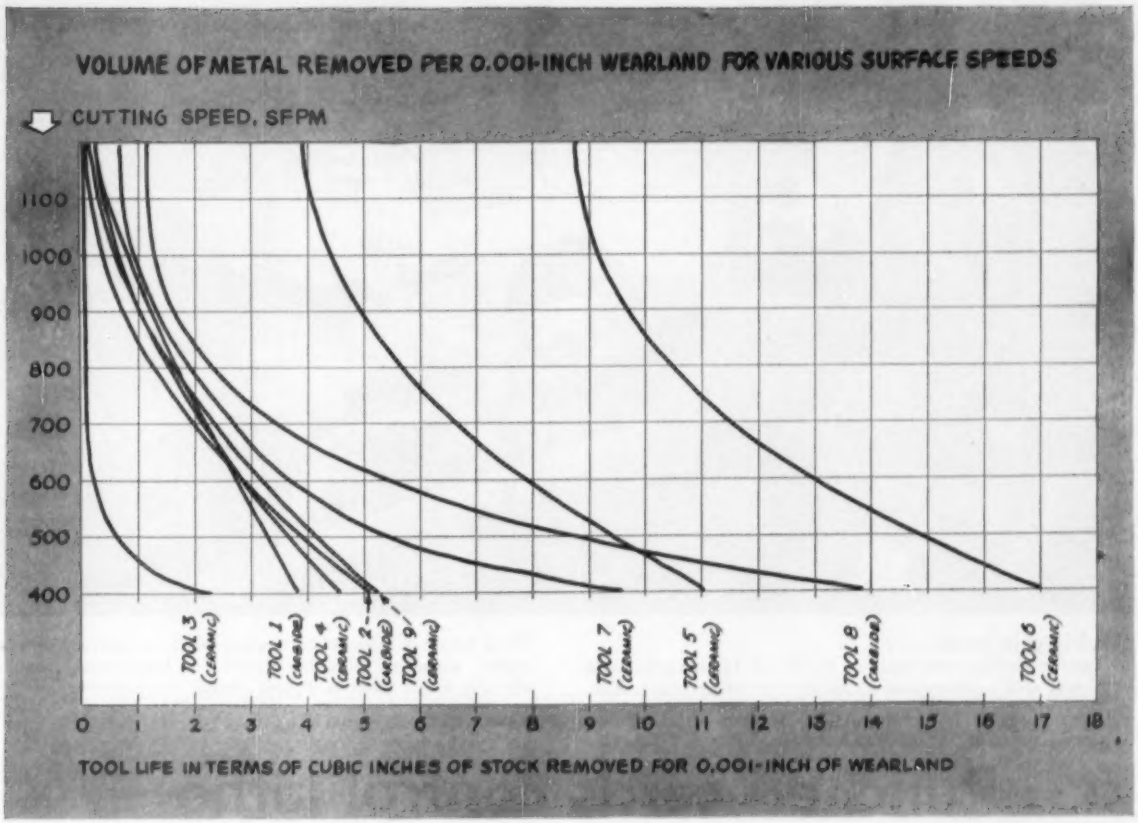
Note: Test cuts were made, at spindle speeds calculated to provide specified surface cutting speeds, on 180 to 190 Bhn test logs of hot rolled AISI C-1050 steel. Cutting rakes were —7°; side cutting edge angles were 15° for all except Tool 5, where it was 30°. Feed in each case was 0.0148 ipr; depth of cut was 0.030 in.

3/16 in. thick, with a 1/16-in. radius on each corner.

Bits were mounted in commercial holders of the type used for throwaway carbide bits. In each case, the holders positioned the bits with –7° back and side rake angles, and with 7° side end clearance angles. Except on Tool 5, where the triangular shape produced a 30° side cutting-edge angle, the holders provided a 15° side cutting-edge angle.

For each test cut, the diameter of the work log was measured, and spindle speed (rpm) calculated for the desired surface cutting speed (sfpm). This spindle speed was set and controlled for the duration of the cut by use of the adjustable-speed drive and a recording voltmeter connected directly with the tachometer generator.

All test cuts were made at 0.0148-ipr feed and 0.030-in. depth. Each cut was continued for the full 36-in. length of the test log, unless it was visually apparent that the tool had completely failed. The test was continued, by repeating the cuts on the same



log, until at least 0.015-in. flank wear was obtained.

At the end of each cut, total revolutions and elapsed time was read from the instrument panel, and flank wear on the tool bit was measured with a 40X microscope containing a calibrated scale permitting readings to 0.001 in. Then the final diameter of the test log was measured, and all readings entered on data sheets.

From these data, volume of metal removed by each tip at each predetermined surface speed was calculated. These values were divided by the total wear measured for each cut to determine the volume of metal removed for each 0.001-in. of tool flank wear. These values, for the nine test tools, are shown in the accompanying table and chart.

Surface speeds from 400 to 1200 sfpm were used during the final test runs because:

1. Speeds above 1200 sfpm resulted in considerable abrasive damage to the cutting edges.

2. Speeds below 400 sfpm were found to result in a rubbing rather than a cutting action. Consequently, each curve for ceramic toolbits would move toward zero if plotted below 400 sfpm.

The chart can be used to determine the expected life of any of the tools tested, for any given amount of wear land up to complete tool failure. For example, if it were desired to use Tool 2 at 700 fpm until it developed a 0.030-in. flank wear land, the maximum amount of stock removal to be expected on a turning operation in C-1050 hot rolled steel would be $30 \times 2 = 60$ cu in.

As is indicated by the chart, the ceramic used in Tool 6 showed outstanding results, but it started to chip along the cutting edge in most cuts soon after the flank-wear land reached a width of 0.015 in. The ceramics used in Tools 5 and 7 were superior to the others in volume of stock removed per 0.001 in. of flank wear and showed little tendency to chip. Tool 7 was markedly better only at lower surface speeds, while Tool 5 showed an important increase in stock removal per unit of flank wear at all speeds.

Of special interest are the results obtained with the high-titanium tungsten carbide (Tool 8), which showed a rapid increase in stock removal per 0.001 in. of flank wear as speeds were decreased in the range from 800 to 400 sfpm. Above 800 sfpm, Tool 8 showed results only slightly better than the other carbides and most of the ceramics. It was far below the best ceramics (5 and 6) in this high-speed range.

Multi-cycle tests . . .
of turning toolbits were made in the Model 14 automatic lathe equipped with a punched-card control (rear of operator). Electrical feedback system for vertical slide on carriage checks turned diameters to within 0.0005 in. Longitudinal feed is checked within 0.005 in. Speeds change automatically

6 . . Punched cards control lathe to test ceramic tools

Ceramics and carbides are compared in a series of tests made on an automatic lathe with dynamically balanced drive. Punched-card control permitted uniform, automatic control of both straight and stepped cuts

L B MONOSMITH, chief engineer, Cutting Tools and W G FISHER, cutting tool research engineer Machine Tool Division
SUNDSTRAND MACHINE TOOL CO, ROCKFORD, ILLINOIS

Ceramic toolbits have been tested at frequent intervals during the past year at the Sundstrand plant in Rockford, both as a part of our continuing program for studying developments in metal cutting tools and procedures which may have use in our own shop operations, and to assemble data and experience which Sundstrand engineers will need in developing machine tools for tomorrow's machining operations.

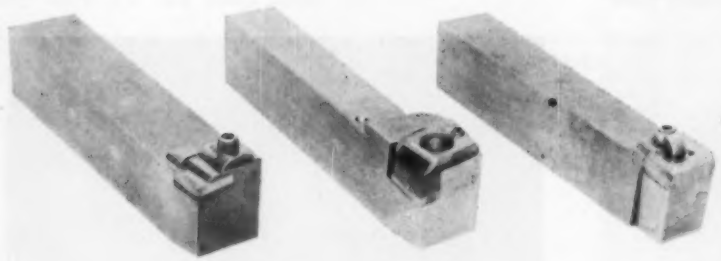
Test results to date indicate that ceramic cutting materials probably have a good future in metalworking plants where parts must be turned at high speeds, and to close tolerances.

It is equally apparent that tool and methods engineers will have to do a lot of development work before these materials achieve a status comparable to that now enjoyed by carbide tools.

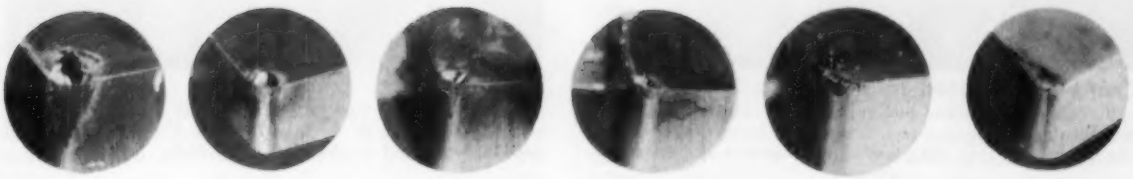
So will the makers of the ceramics and the designers of machine tools. And managers of metalworking plants will find it necessary to budget for the installation of heavier, higher-powered machines with higher spindle speeds if they expect to benefit from the cost savings the ceramics now appear to make possible.

The problems which must be solved before ceramics can be used effectively are similar to those faced by pioneer users of carbide tools when they were introduced some 30 years ago.

Then, difficulties were encountered because the carbides were misapplied, their ultimate properties had not yet been developed, their quality was not consistent, and the machine tools in which they were tried did not have sufficient power, speed, or rigidity for their effective use. Too, their cost was



Three clamp-type toolholders . . . are for testing carbide and ceramic bits in lathe, so triangular and rectangular bits can be used interchangeably. Holder in center was designed by Sundstrand for future trials of bits set at positive rake angles



CARBIDE C2	CARBIDE HIGH TITANIUM	CARBIDE C7	CARBIDE C8	CERAMIC (A)	CERAMIC (B)
3.9 MIN.	9.1 MIN.	5.2 MIN.	9.1 MIN.	9.1 MIN.	15.7 MIN.
0.160 FLANK WEAR	0.030 FLANK WEAR	0.095 FLANK WEAR	0.030 FLANK WEAR	0.030 FLANK WEAR	0.020 FLANK WEAR
0.100 WIDE CRATER	0.065 WIDE CRATER	0.050 WIDE CRATER	0.035 WIDE CRATER	NO CRATER	NO CRATER
TOOL GEOMETRY: -5, -5, 5, 5, 10, 10 1/16	TOOL GEOMETRY: -5, -5, 5, 5, 8, 8 3/64	TOOL GEOMETRY: -5, -5, 5, 5, 10, 12 1/16	TOOL GEOMETRY: -5, -5, 5, 5, 10, 10 1/16	TOOL GEOMETRY: -5, -5, 5, 5, 10, 13 1/16	TOOL GEOMETRY: -5, -5, 5, 5, 0, 30 3/64

Carbide and ceramic bits were damaged . . . as shown when turning annealed, cold-finished bars of SAE 4140 steel (187 Bhn) at 950 fpm for time shown under each bit. Tests were made with 0.030-in. depth of cut and 0.012-ipr feed so cutting edges could be compared. Note that the two ceramic bits did not crater, as did all of the carbides

considerably higher than that of the high-speed-steel tools they were replacing.

Tool designs had to be revised, better machine tools had to be developed and installed, and a new approach to usable cutting speeds and feeds had to be evolved before the carbides were accepted.

The ceramics seem destined to a similar apprenticeship. However, pressures to cut costs and increase production rates today are so strong it seems certain the ceramics will move forward much more rapidly than did the carbides.

New lathe for tests

Data developed while testing ceramics in the Sundstrand plant were disappointing until the program was transferred to a Model 14 automatic lathe installed for prototype demonstrations. Even then, it was necessary to dynamically balance the V-belt drive sheaves to eliminate a slight amount of vibration at the tool point before satisfactory test results were achieved.

Designed especially for production cuts in alloy steels at high speeds, this Model 14 lathe is advantageous for repeated test cuts becauee it has been equipped with punched-card automatic cycle controls, and has an automatically indexed tool turret so roughing and finishing cuts can be taken alternately without change of setup.

Driven by a 40-hp motor, this lathe has a spindle-speed range of 290 to 1640 rpm with the set of pick-off change gears installed for the ceramic-tool tests. Speed changes between roughing and finishing passes are automatic, when desired, under control from the punched-card reader. In addition, when repeated finishing cuts are run on a test log, until tool failure occurs, spindle speed automatically can be increased between passes to hold the cutting speed substantially constant.

Data from typical tests

Accompanying tables list typical data from two recent test runs, when SAE 4140 and SAE 8620 test logs were machined with two makes of ceramic toolbits, and with both conventional steel cutting grades of cemented carbides and two of the recently developed high-titanium grades of tungsten-titanium carbides for comparisons.

Repeated 15-in. long cuts were taken at speeds from 690 to 1435 sfpm when turning the 3½-in. OD, annealed and cold-finished SAE 4140 steel logs. Feeds ranged from 0.012 to 0.0165 ipr, and depths of cut from 0.020 to 0.125 in.

A review of the tabulated data for cuts taken on the SAE 4140 logs indicates that, while the ceramic bits can be used for cutting speeds considerably higher than can be achieved economically with con-

6 . . Punched cards control lathe to test ceramic tools

Crater has started to show . . .
in face of high-titanium carbide bit (left) in trials on SAE 8620 shafts; despite this fact, it outlasted ceramic bit (right) which started to chip along leading edge because of overloading when finishing tool cuts into metal left at shaft shoulders by roughing tool with 8° lead angle. Both bits were used until 0.005-in. wear land developed on their flanks

ventional steel-cutting grades of cemented carbides, they also should not be used at the highest possible speeds if economic tool life is to be achieved. Cutting speeds of 690 and 950 sfpm, for example, resulted in longer tool life than did the highest speed (1435 sfpm) tried.

The data tabulated for finishing cuts on hot rolled and normalized SAE 8620 stepped shafts resulted from a brief test made to compare one of the ceramic toolbits with a recently received sample of a new high-titanium cemented carbide. It is of interest to note that in this case the carbide out-performed the ceramic under identical cutting conditions.

For each SAE 8620 shaft, the shaft end first was rough turned in two passes (see sketch) at 350 sfpm with a conventional steel-cutting carbide bit clamped in a holder. Feed was 0.025 ipr during the heavier portions of the roughing cut; it automatically was changed to 0.036 ipr when depth of cut was reduced. During the first roughing pass, the cut required 43 to 45 hp.

Then, at the end of the second roughing cycle, the punched cards automatically indexed the toolholder to position the second tool for the single finishing pass.

Toolholders used for all ceramic-tool tests made to date position the ceramic and the carbide bits at 5° negative side and back rakes. They have clamped-type chipbreakers adjustably-positioned for proper chip control. In a few cases, the bits were reground around the edges to increase side- and end-clearance angles to 7°, but in most cases the 5° clearance angles provided by tipping the bits to secure the negative rake angles proved sufficient.

No cutting fluid was used for any of the tests made to date. However, it is believed that in some cases delivery of a cutting fluid between the face of the tool and the workpiece, by directing a cooling mist or flood stream from under the heel of the toolholder, may prove beneficial. We understand that other testers of ceramic toolbits already have tried this with some increase in tool life.

TOOLBIT MATERIALS USED IN TESTS

CERAMIC TOOLBITS:

A—Black ceramic, ½ x 1-in. rectangle, ⅜ in. thick. Ground with diamond wheels, using coolant.
B—Black ceramic, ½ x 1-in. rectangle, ⅜ in. thick. Ground with diamond wheels, without coolant.
C—White ceramic, ½ x 1 5/16-in. rectangle, ⅜ in. thick. Ground with diamond wheels, using coolant.
D—White ceramic, ½ x 1 5/16-in. rectangle, ⅜ in. thick. Ground with diamond wheels, without coolant.
E—Black ceramic, ½-in. triangle, 3/16 in. thick.

CARBIDE TOOLBITS:

L—Tungsten-titanium carbide (low Ti content), ½ x 1-in. rectangle, ⅜ in. thick.
M—Tungsten-titanium carbide (high Ti content), ¾-in. square, 3/16 in. thick.
N—Tungsten carbide, ½ x 1-in. rectangle, ⅜ in. thick.
P—Tungsten carbide, ½ x 1-in. rectangle, ⅜ in. thick.
S—Tungsten-titanium carbide (high Ti content), ½-in. triangle, 3/16 in. thick.

TEST CUTS ON SAE 8620 SHAFTS

Tool Used for Cuts					Cut Taken				Results
Toolbit Material	Shape of Bit	SCEA Deg.	ECEA Deg.	Nose Rad. (in.)	Speed (sfpm)	Feed (ipr)	Depth (in.)	Tool Travel	Tool Wear & Remarks
Ceramic E	Tri	0	30	3/64	810 to 1230	0.011	0.030	64½	Flank wear: 0.005-in. No. of shoulders cut: 30. Leading edge chipped.
(Note: Tightly curled chips broken off in relatively short lengths.)									
Carbides	Tri	0	30	3/64	810 to 1230	0.011	0.030	107½	Flank wear: 0.005-in. No. of shoulders cut: 50. No chipping of leading edge.
(Note: Tightly curled chips broken off in longer lengths than when ceramic toolbit was used.)									

Note: These data were recorded while finish turning five diameters on first-operation ends of SAE 8620 shafts (see sketch) until 0.005-in. flank wear had been developed on the two toolbits. The ceramic tool bit finish turned six shafts; the cemented carbide bit finished ten shafts. Five diameters were finished on one end of each shaft with the bits set at 0° lead angle (SCEA). This imposed a heavy cutting load on the finishing bits at each shoulder, since the roughing pass that immediately preceded each finishing pass automatically was taken with a throwaway-type cemented carbide tool bit with an 8° lead angle (SCEA), and the finishing bit was required to square each shoulder. Chipping of the ceramic bit is believed to have been caused by the repeated shocks of moving from a 0.030-in. deep cut into the shoulder cut (up to ¼ in. deep) five times during the turning of each shaft. The carbide bit was able to withstand these impacts to a greater extent than did the ceramic bit.

TEST CUTS ON SAE 4140 LOGS

TOOL DATA					CUT TAKEN				RESULTS		
Toolbit material	Shape of bit	Side cutting-edge angle, deg.	End cutting-edge angle, deg.	Nose radius, in.	Speed, sfpm	Feed, ipr	Depth, in.	Tool travel, in.	Crater	Edge wear, in.	Remarks
Ceramic A	Rect.	0	8	3/64	950	0.012	0.030	20½	No	0.050 in.	
Ceramic A	Rect.	10	10	3/64	925	0.012	0.030	98¼	No	0.080 in.	Edge chipped (excessive wear) Note 1.
Ceramic A	Rect.	10	10	1/16	950	0.012	0.030	66	No	0.020 in.	Very good finish
Ceramic A	Rect.	0	10	1/32	1435	0.0125	0.020	4	No	0.080 in.	Chatter
Ceramic A	Rect.	0	15	5/64	950	0.012	0.030	48	No	0.025 in.	
Ceramic A	Rect.	0	15	1/16	1435	0.012	0.020	32	No	0.090 in.	Chatter
Ceramic A	Rect.	0	12	1/16	1435	0.012	0.020	21	No	0.080 in.	Chatter. Note 2.
Ceramic A	Rect.	10	13	1/16	950	0.012	0.030	115	No	0.035 in.	0.015 in. chip on radius, good finish.
Ceramic A	Rect.	10	13	1/16	950	0.012	0.030	115	No	0.030 in.	No chatter
Ceramic B	Rect.	10	10	1/16	690	0.012	0.030	130	No	0.015 in.	Good finish. Note 1.
Ceramic B	Rect.	10	10	1/16	690	0.012	0.030	270	No	0.015 in.	Good finish. Note 3.
Ceramic B	Rect.	10	10	1/16	950	0.012	0.030	82½	No	0.015 in.	Finish torn
Ceramic B	Rect.	10	13	1/16	735	0.012	0.030	66	No	0.020 in.	
Ceramic B	Rect.	10	13	1/16	690	0.012	0.030	245½	No	0.025 in.	Very good finish
Ceramic B	Rect.	10	13	1/16	690	0.012	0.030	245½	No	0.025 in.	Very good finish
Ceramic B	Rect.	10	13	1/16	690	0.0165	0.030	245½	No	0.025 in.	Very good finish
Ceramic B	Rect.	10	13	1/16	950	0.012	0.030	181½	No	0.050 in.	Very good finish
Ceramic B	Rect.	10	10	1/16	900	0.012	0.125	66	No	0.025 in.	Very good finish
Ceramic B	Rect.	10	12	1/16	1435	0.0125	0.020	132	Very small	0.065 in.	Good finish
Ceramic B	Rect.	10	14	1/16	1435	0.0125	0.020	115	No	0.120 in.	0.040 in. wide chip on top surface.
Ceramic B	Rect.	10	12	1/16	1435	0.0125	0.020	64	No		Chipped on SCEA, ECEA nad ECECA surfaces.
Ceramic C	Rect.	10	10	1/16	690	0.012	0.030	66	No	0.060 in.	Good finish
Ceramic C	Rect.	10	10	1/16	690	0.012	0.030	33	No	0.050 in.	Tip broke down completely
Ceramic D	Rect.	10	10	1/16	690	0.012	0.030	7	Yes		0.150 in. wide groove crater worn in top face.
Ceramic E	Tri	0	30	3/64	950	0.012	0.030	132	Very small	0.015 in.	Torn finish
Ceramic E	Tri	0	30	3/64	950	0.012	0.030	198	No	0.020 in.	Very good finish
Ceramic E	Tri	0	30	3/64	1000	0.0128	0.030	50	No	0.010 in.	0.020 x 0.030 in. chip broken from SCEA edge, torn finish.
Carbide L	Rect.	10	10	3/64	950	0.012	0.030	60%	0.055 in. wide	0.025 in.	Good finish. Note 1.
Carbide L	Rect.	10	10	1/16	690	0.012	0.030	99½	0.025 in. wide	0.025 in.	Finish torn as edge broke down. Note 4.
Carbide L	Rect.	10	10	1/16	690	0.012	0.030	36	0.025 in. wide	0.015 in.	Checkered chatter. Note 5.
Carbide L	Rect.	10	10	1/16	950	0.012	0.030	49	0.050 in. wide	0.025 in.	
Carbide L	Rect.	10	10	1/16	690	0.0165	0.030	66	0.055 in. wide	0.015 in.	High-frequency chatter.
Carbide L	Rect.	10	12	1/16	950	0.012	0.030	66	0.050 in. wide	0.095 in.	Chatter. Note 6.
Carbide M	Sq	8	8	3/64	950	0.012	0.030	115	0.065 in. wide	0.025 in.	Sporking noticeable. Note 7.
Carbide M	Sq	8	8	3/64	950	0.012	0.030	115	0.065 in. wide	0.030 in.	Note 7.
Carbide N	Rect.	10	10	1/16	950	0.012	0.030	49	0.100 in. wide	0.160 in.	Chatter. Note 6.
Carbide P	Rect.	10	10	1/16	950	0.012	0.030	115	0.035 in. wide	0.030 in.	Chatter. Note 6.

Notes:
1. Part hot, toolbit very hot after cut completed.
2. Clearance angles increased to 7°.
3. First 140 in. of tool travel resulted in mirror finish on workpiece surface.
4. Part hot, toolbit very hot after cut completed; high-frequency whine started on second cut; chatter marks evident on work surface.
5. High-frequency whine developed after 5 in. of tool travel.
6. High-frequency whine developed during this cut.
7. High-frequency whine developed while turning third piece.

7.. Ceramic tools are evaluated...

...To learn how long they last
...What speeds and feeds are best
...And where they are best applied

Extensive cutting tests run on oxide cutting tools determine their value for production turning. Various materials were machined at different feeds, speeds, and depths of cut and the results compared with optimum grades of carbide tools. Here are the results of the tests, together with several case histories of actual production applications

GEORGE H DE GROAT, DETROIT EDITOR

The effect of ceramic tooling on machine design has been studied first hand by Monarch Machine Tool Co, Sydney, Ohio. Under the direction of A B Albrecht, metallurgical engineer, extensive tests have been run in the Monarch Metal Turning Research Lab with oxide cutting tools produced by Diamonite Products Div, United States Ceramic Tile Co. Main purpose of the program, from Monarch's point of view, was to learn something of the performance characteristics of these relatively new cutting tools—how much, if any, redesign will be necessary in machine tools, what will be required in machines to take advantage of the peculiar characteristics of ceramic tools, and other data of importance to a lathe builder.

Diamonite, on the other hand, wanted a comprehensive and objective test of their product. Basically, Diamonite oxide cutting tools are made of specially prepared crystals of high-purity aluminum oxide formed under high pressures and fired at high temperatures. This material was originally developed to provide properties close to those of the sapphire for spark-plug insulators in military aircraft. For this purpose, the material had to have high physical strength, high dielectric strength, and high thermal shock resistance over a wide range of temperatures, as well as low coefficient of expansion and high thermal conductivity.

In machining spark-plug insulators it was found that HSS and carbides dulled quickly. Even natural sapphires and diamonds proved unsuccessful, so it was decided to try tools made of the material itself. These were successful and are still used to machine such parts.

Experiments in the use of Diamonite for machining metals and other materials proved that aluminum oxide offered many advantages as a tool material which would permit accelerated material removal rates. But they also revealed certain weaknesses, notably brittleness and low impact strength. While some progress was made in overcoming these disadvantages by processing developments, best results were obtained by concentrating on tool support and tool geometry to provide greater strength where failure occurred.

Another difficulty was lack of uniformity. Some tools gave excellent results while others of exactly the same composition failed almost immediately upon entering the work. From this, it seemed evident that aluminum oxide alone is not the only essential of a satisfactory oxide cutting tool. Accordingly attention was turned to control in processing to insure uniformity. Finally, when several processing methods had been developed, it was desirable to test the results with the latest in fast, powerful machines and with recently developed electronic stress-measuring equipment.

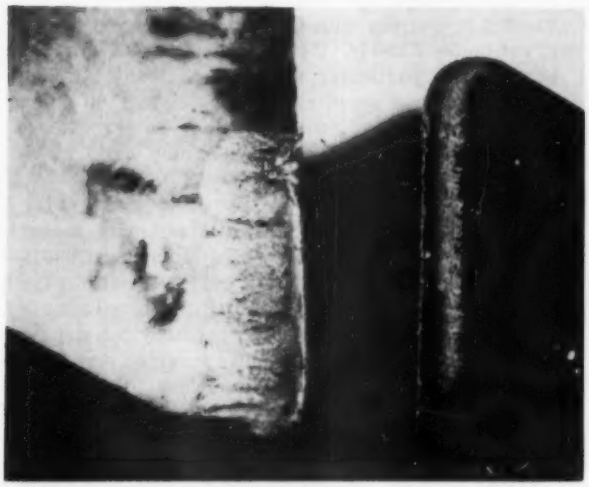
Tests were objective

Standard shapes were provided Monarch to run on a Mona-Matic-18 machinability test lathe with a 6000 rpm head for high-velocity turning. All cutting tests were performed dry with the toolbits supported in mechanical holders. Clamping pressure on the tool tip was evenly distributed to prevent localized stresses and adjustable carbide chip breakers were used along with the oxide blanks. Dynamometer tests were made with a two-component strain gage cantilever toolblock.

No modifications or adjustments were made to standard tool geometry to make the tools perform successfully in any particular setup. Tests were run on tools "right out of the box" in order to be as objective as possible. Of course, certain data on tool angles resulted from the tests and specific recommendations are suggested for particular applications.

Advantages and limitations

According to an evaluation in the Monarch report the chemical and physical properties which make



Comparison of wear pattern . . .
for oxide and carbide tools shows normal crater pattern in carbide (right). Here, chips weld to the tool surface, producing an iron-tungsten alloy. As the chip flows off the tool surface, the weld is sheared loose and particles of carbide are removed with the chip. Surface wear of oxide tool is from mechanical breakdown of oxide grains in tension. Extent of wear is determined by the chip load, cutting time, and surface speed

Wear on oxide tool . . .
after turning cast iron at 850 sfpm indicates no surface cratering and cutting edge is still sharp. Edge strength is sufficient to support relatively light tool loads. With cast iron, wear is principally a function of abrasion

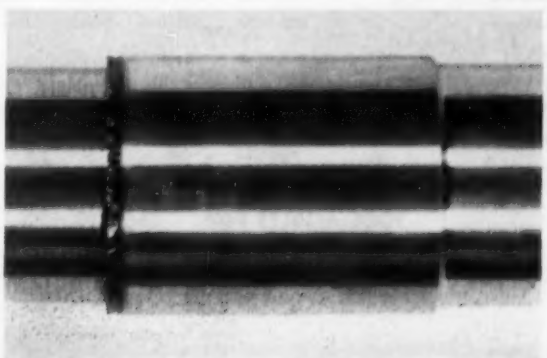
ceramic tools suitable for cutting operations are:

1. High load-carrying capacity under compression
2. Inherently low thermal conductivity in comparison with other tool materials and high resistance to heat
3. High hot hardness and resistance to abrasion
4. Chemically inert to surface welding and attack by the chip
5. Low rate of thermal expansion

These favorite properties are counterbalanced by weakness of the material in tension—only one-tenth that of the compressive strength. Cutting tests have shown, however, that with proper machining techniques, their full potential as cutting tools can be realized. The oxide tools have lower thermal conductivity and better resistance to high temperatures and rapid cooling than carbides, thus permitting the use of higher cutting speeds than is practical with carbides.

Some of the tools tested showed considerable brittleness and others processed by improved methods had considerably better edge strength. In all cases, however, it was found essential to support the tools rigidly in machine tools that operate at high spindle speeds without chatter. The tool blank can be sup-

When cutting edges are chipped . . .
tool buildup develops a point of stress concentration which start cracks in oxide tools. Under heavy loads, and where chatter is present, tool edges break down rapidly. However, heavy cuts can be taken with ceramic tools when the chip load is properly distributed over the tool surface. This can be accomplished by selecting a heavier depth of cut and reducing the feed rate



High cutting speeds . . .
produce good finishes, 8 to 12 mu in. rms in this case, but also present problems. Partial transformation of the metal is caused by high heat transmitted from the tool to the work leaving a roll at the end of the cut. In some cases, it is difficult to break a chip at high cutting speeds because of increased ductility of the metal

nesses, notably brittleness and low impact strength.

the chemical and physical properties which make

7 . . Ceramic tools are evaluated . . .

ported by a carbide seat in the holder (to prevent flexing and Brinelling), with the thickness of the blank about one-third greater than that of a comparable carbide insert. Brittle tools with relatively low edge strength (purposely chosen to check on certain manufacturing methods) were limited in chip-load capacity. As a result, tests showed their application to be limited to:

1. Finish machining where maximum depth of cut was 0.080-in. and primary concern was finish and accuracy.
2. Finish turning heat-treated parts in the hardness range of 26 to 42 R_c.
3. Rough and finish turning light alloys, such as brass, aluminum, and magnesium, that have a low unit shear in cutting.
4. Turning such non-metallic materials as nylon, fiber, and cloth-reinforced plastics, and others where high speeds are needed to prevent tearing and where abrasion is a problem.
5. Turning cast-iron parts.

In general, however, and especially under light loads, a very good wear pattern was obtained. Edge strength of oxide tools is sufficient to carry the chip load and wear becomes mainly a function of abrasion. Wear is evidently caused by mechanical breakdown of the oxide grains in tension so that tool life is determined by the density, bond strength, and crystalline structure of the ceramic body. Distribution of the chip load over the tool surface is another important factor that affects wear. Unlike carbides (which tend to crater severely at high cutting speeds as the result of an alloying or welding effect that occurs where the chip is in contact with the tool surface) the chemically inert oxide tools have no alloying action.

Most test applications of oxide tools were in finish turning operations with fairly light feeds and depths of cut below 0.200 in. Cutting speed varied with the hardness of particular tools. On a 0.45% carbon steel the normal speed range was 600 to 1100 sfpm. Indications are that oxide tools may be practical at speeds of 1600 to 2800 sfpm, which may well change many current machining concepts.

With the exception of a few individual grades, maximum metal removal rate with oxide tools tested was 48 to 56 cu in. per min, (1200 sfpm speed, 0.016 ipr feed, and 0.200-in. depth of cut) well within the capacity of 20-hp machines. Cutting tests indicate that oxide tools can be used successfully for tracing or contour turning operations provided the tool doesn't have to plunge into the work. They were found to have sufficient strength to cut to a shoulder if the tracer response is active enough to prevent a dwell at this point.

Oxide tools are usually unsuitable where the tool must cut through heavy scale or where intermittent cuts are required. Under these conditions, as well as with heavy loads where there is a tendency to chatter, the tool edge breaks down rapidly. Particles break loose as the tool works in the cut. Moreover, heavy chips tend to fracture the back of the tool as they flow away from the work, thus leading to complete failure. This has occurred in rough turning and tracing where breakdown at the heel of the cut resulted from the impact of the chip against the tool as it flowed from the work surface.

Variables in a plant that can limit the maximum practical cutting speed, and might thereby restrict the use of ceramic tools in production include:

1. Variations in material
2. Excessive stock on forgings and out-of-round parts
3. Heavy surface scale

SPEEDS AND FEEDS FOR CERAMICS

(45 to 60 min tool life)

DIAMONITE GRADE C

Material	Bhn	Sfpm	Feed	Max. Depth	Remarks
AISI-8617	187	800-1000	.006-.014	0.400	Use positive rake angles
C-1117	169	950-1100	.006-.012	0.325	Don't overbreak chip
AISI-4145	192				
Roughing		600- 700	.007-.016	0.400	Hone cutting edge 1/32 Rc
Finishing		850-1050	.005-.010	0.062	Max cutting speed 1100 fpm
12% Cr					
Tool Steel	229	4251 500	.004-.012	0.250	Keep chip load light
Naval Brass	136	1600-2000	.007-.018	0.400	Chip breaking a problem
Meehanite	197	700- 850	.007-.018	0.325	Use 3/64 to 1/16 nose radius

TOOL ANGLES FOR SINGLE-POINT OXIDE TOOLS

Condition	BR	SR	Relief	SCEA	FCEA	Nose
Finish turning steel	–7	–7	7	15	15	1/32 – 3/64
Finish turning nonferrous	0	6	7	0–15	9–15	1/32 – 3/64
Finish tracing	–7	–7	7	9	12	1/32

at high cutting speeds because of increased ductility of the metal

CERAMIC TOOLS . . .

4. Obsolete equipment
5. Poor tool setups with lack of rigidity
6. Multiple operations with one or more tools
7. Non-uniform depth of cut

These and other factors might force an operator to reduce speeds and increase feeds, leading to tool breakage. Speeds and feeds are critical—maximum effectiveness of these tools requires good equipment.

Geometry and general recommendations

Test results showed that negative rake angles produce a stronger cutting edge and are therefore preferred for heavy cuts. On light alloys the positive rake results in cleaner cuts and better finishes. For general turning, a 1/32-in. nose radius is recommended. On nonferrous materials and cast iron, the nose radius should be increased to 3/64-in. Whenever possible the tool should lead into the work with a 15° side cutting-edge angle. In general, oxide tools should not be allowed to dwell during the cut. As the chip is lost, build-up occurs and causes tool breakage when the cut is picked up again.

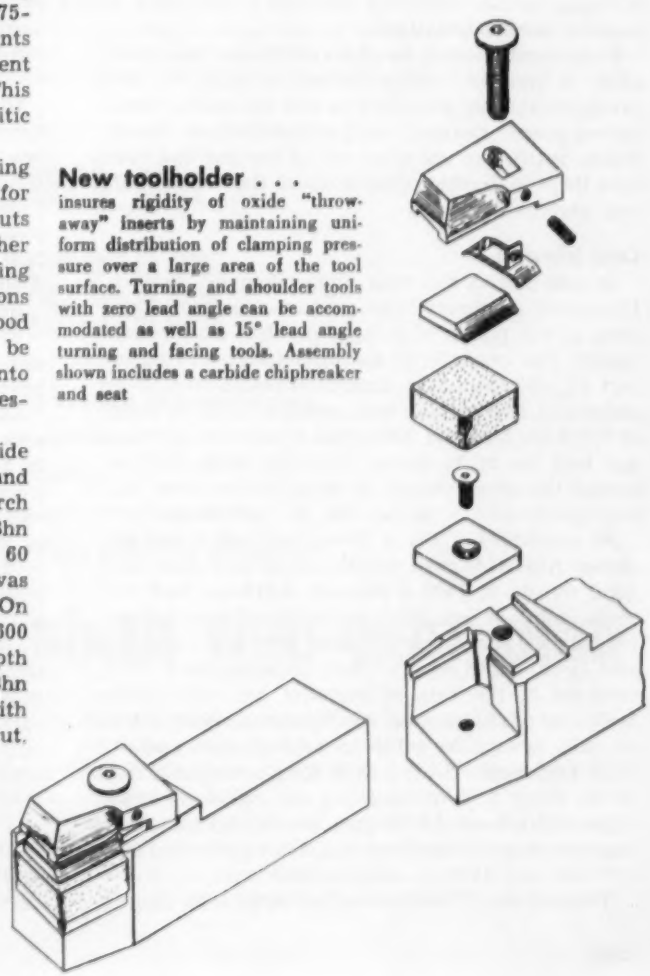
The ratio of feed to depth of cut is important. Heavier than usual cuts can be taken with oxide tools if the chip load is properly distributed over the tool surface. This can be accomplished by using light feeds combined with depths of cut up to 0.375-0.400 in. Sometimes it is necessary to use coolants with oxide tools at high cutting speeds to prevent chips from rewelding to the work surface. This problem was encountered mainly in turning ferritic and single-phase alloys.

In general, these tools may be used at cutting speeds 50% greater than those recommended for carbides on similar operations. On finishing cuts where the tool has sufficient edge strength, higher cutting speeds may be used. However, cutting speed, although important in many applications where distortion is a problem, or specially good finishes are important, is not the only factor to be considered in metal removal. A user must take into account both cutting speed and depth of cut to establish a machining rate.

In comparison with an optimum grade of carbide for the materials machined, speeds were higher and feeds lower to achieve good results in the Monarch tests. For example, in machining AISI 8617 (Bhn 187) oxide tool life was approximately 45 to 60 min. Cutting speed was 800 to 1000 sfpm, feed was 0.006 to 0.014 and depth of cut was 0.400-in. On the same material carbide was run at 500 to 600 sfpm, feed was up to 0.015 to 0.030 ipr, while depth of cut was the same. For roughing AISI 4145 (Bhn 192), oxide tools were run at 600 to 700 sfpm with 0.007 to 0.016 ipr feed and a 0.400-in. depth of cut. Carbide for this operation was run at 350 to 450 sfpm with a feed of 0.015 to 0.028 ipr and the same depth of cut. For finishing, 850 to 1050 sfpm cutting speed was used with oxide tools. Feed was 0.005 to 0.010 ipr feed and depth of cut was 0.062-in. Carbide for finishing ran at 500 to 650 sfpm with the same feed and depth of cut.

Although chip breaking was a problem, speeds of 1600 to 2000 sfpm were used with oxide tools to machine Naval brass at a feed of 0.007 to 0.018 ipr and a depth of cut of 0.400-in. Carbide was run at 650 to 750 sfpm with the same feed and depth of cut. High speeds were also used to machine C-1117 (Bhn 169). Here oxide tools were run at 950 to 1100 sfpm while carbides worked best at 600 to 700 sfpm. Feed for the oxide tools was 0.006 to 0.012 ipr with carbides only slightly greater, 0.010 to 0.020 ipr. Depth of cut for both was 0.325 in.

Application of these data must take into account rigidity of the machine tool, available speed range, and the amount of stock to be removed. Diamonite tools appear to be particularly effective in turning higher carbon steels and the non-ferrous metals



New toolholder . . . insures rigidity of oxide "throw-away" inserts by maintaining uniform distribution of clamping pressure over a large area of the tool surface. Turning and shoulder tools with zero lead angle can be accommodated as well as 15° lead angle turning and facing tools. Assembly shown includes a carbide chipbreaker and seat

7 . . Ceramic tools are evaluated . . .

Typical parts machined with oxide tools . . . include (from left to right), a center shank that was chamfered and a copper-iron bushing on which the OD was turned at 2000 sfpm with 0.006-ipr feed and 0.015-in. depth of cut. Surface finish was 12 mu in. rms. The cast-iron collar OD was also turned at 490 sfpm with a feed of 0.016 ipr and a depth of cut of 0.062 to 0.087 in. A finish turning and facing operation was performed on the gear blank at the far right. Material is AISI 4145, (Rc 36) and the speed used was 530 sfpm, fed 0.010 ipr with a depth of cut ranging from 0.034 to 0.060 in.

whereas surface cratering occurred occasionally in turning low carbon steels.

Consideration must be given particular jobs, however. A user who wants the tool to work will find the optimum tool geometry to suit his needs—much as was done in the early days of carbide tools. Rarely was it possible to use them out of the box and even now there is divided opinion about the best carbide tool angles.

Case histories

In addition to the tests undertaken at Monarch, Diamonite engineers have conducted practical field tests in the plants of a large number of manufacturers. For example, in machining an iron ring insert (R_c 45) for a 5-in. aluminum piston on a 20-hp automatic, two carbide tools removed ¼ in. of metal at 0.012-ipr feed and 3000 sfpm speed with an average tool life of 35 pieces. A single oxide tool removed the same amount of metal at the same feed and speed, with a service life of 1000 pieces.

In machining a 1¼ x 22-in. hot rolled and annealed AISI 4145 steel spindle, oxide tools gave very good results at 1400 sfpm with 0.012-ipr feed and ⅛-in. depth of cut. With conventional carbide tooling, surface speed was 700 sfpm with 0.003-ipr feed and ⅛-in. depth of cut. This amounted to a 700% increase in the rate of material removal. Oxide tools also produced good results in machining a 3⅝-in. side surface on a 100-in. aircraft part made of AISI 4130 steel. Using a 12-ft King boring mill with 75-hp drive, a ¼-in. roughing cut was made at 600 sfpm with a feed of 0.021 ipr. The finishing and facing operation was performed at 800 sfpm with 0.021-ipr feed and 0.030-in. depth of cut.

Turning the 20-in. face of an AISI 1035 aircraft part, oxide tools were used at 840 sfpm with 0.016 ipr feed and 0.205-in. depth of cut. In production turning with carbide tools, speed was 235 sfpm, 0.033-ipr feed and ⅛-in. depth of cut.

In another case where the rate of material removed was more than tripled, 2-in. dia S-7720 stainless was turned on a 15-hp Jones & Lamson lathe. With carbide tools, speed was 126 sfpm, feed was 0.007 ipr, and the depth of cut ¼ in. Speed was increased to 390 sfpm with oxide tools using the same feed and depth of cut. Later, even better results were obtained when the feed was increased to 0.015 ipr and the depth of cut reduced to ⅛ in.

Several facts have been brought to light by these and numerous other tests which have an important bearing on the successful application of oxide tools.

Of primary importance for satisfactory performance of these tools is complete absence of vibration. In field tests, apparent tool failure was frequently traced to vibration in either the tool or the work and these failures were overcome by providing proper tool and work support. While proper attention to this detail can contribute to longer tool life and better results with any type of tool, it is essential with oxide tools because of their more brittle nature. To provide this vital rigidity, surfaces of the tool and seat must be absolutely flat and clamping pressure must be applied uniformly over as much of the tool surface as possible. The chip breaker should be independent of the clamp so that clamping pressure may be distributed properly. Rigidity of the work is also important and this is a function of part geometry. The limiting factor in turning with oxide tools is most often the length-to-diameter ratio of the work. Long, slender parts must be adequately supported to eliminate vibration.

From no machine tools to automation in just 25 years . . .

SOME IDEA OF THE SCOPE of today's Russian-produced machine tools is shown in this view of transfer machines in the assembly bay of the Ordzonikidze Machine Tool Plant in Moscow. This view of modern industry in the USSR is a startling one when you compare it with the Russia of just 25 years ago—an agricultural nation with no machine tools and no major industry

Report on RUSSIA

This is fair warning—let American Metalworking beware of complacency.

Soviet Russia is sparing no expense, no effort, to oust the

United States as world leader in industrial production.

Just how far away is this goal? The Russians say less than five years.

Here is the authentic on-the-spot report of American Machinist editors on . . .

PART 2 . . . Russia's sixth five-year plan

MOSCOW—Soviet Russia has every intention of usurping the United States' dominant lead in world production and technology by 1960, when the USSR's just-begun Sixth Five Year Plan will end.

The new Plan calls for an even-more-intensive industrial and economic development program than the Fifth Five-Year Plan, which, according to Russia's own official figures, chalked up this impressive record in the years 1950 through 1955:

- **Industrial output increased by 85%.**
- **"Production of the means of production" increased by 91%.**
- **Total metalworking output increased by 220%.**

. . . And Russia's industrial production increased 220% in the years 1940 to 1955.

In still another field, Russia intends to build mech-

Report on Russia . . . Part 2

anized automatic rolling mills of types comparable to the world's best.

Russia urgently needs to economize on metal. This is borne out not only by plans to greatly increase iron and steel output, but by specific instructions aimed at the machine tool designer.

Russia still has far too many old lathes, most of them totally inadequate for modern turning. For example, some of them have spindle speeds of only 150 to 400 rpm. But at Ordzonikidze, new types of lathes are being built with speeds up to 2000 rpm.

Lacking, too, are enough automatics and semi-automatics, boring, gear-cutting, grinding, forging and stamping machines. And foundry machines presently in use have only about one-third to one-fourth the capacity of modern equipment.

To quote from the directive for the Sixth Five Year Plan, "In designing and producing lathes, machines and equipment, the machine builders must pay particular attention to lowering expenditure of metal by improving designs, using economical rolled shapes, and replacing metal with plastics."

Russia's instrument manufacturing and electronic industries will come in for a good deal of attention. To provide sufficient quantities of control equipment for automation, Russia is scheduled to build 32 specialized instrument plants within the next five years. Research and laboratory facilities will be enlarged, doubtless to allow for increased production of computing equipment. Look for Russia to adopt the principles of numerical control on a large scale.

Modernization of existing machine tools will be a big factor in the program. The Russian government has often implied that its plants have to build too many of their own fixtures and gages, with insufficient help from machine tool builders. That situation will be corrected by a special department of Russia's major developmental organization, ENIMS.

Automation will play a vital role in Russia's forthcoming industrial boom. As Bulganin himself said in a recent speech, "the economic effect of automation in engineering works is high. Our up-to-date production lines make it possible to reduce the number of workers to between approximately one-fifth and one-tenth of what it was, and to curtail working time in processing to the same extent."

Those gains are impressive by any standards, but the Russians still aren't satisfied with their industrial, technological and economic progress. The Sixth Five Year Plan calls for an even greater effort to achieve Russia's goal of world industrial leadership.

Take for example production of machinery—the "production of the means of production"—that is the heart and soul of the program. This is planned to increase 70% by 1960. Compared with 1940, this means that the Soviet will have to increase machine production 560% over its 1940 quota. To accomplish this end, Russia is preparing to turn out an unprecedented quantity of modern machine tools, automation equipment and instruments, forging and stamping machines. Keeping pace will be tremendous expansions of electric power producing facilities, and of the iron and steel, oil, coal and chemical industries.

Russia's government is well aware that the country still has far too few machine tools. Last year, various engineering ministries were sharply criticized for holding up Russia's production potential. It is fully appreciated that the machine tool industry must keep well ahead of other industries. That is why an 80% increase in the output of machine tools is vital to the Sixth Five Year Plan.

To accomplish this, metalworking plants must be re-equipped with the newest in lathes, forging and stamping machines, with foundry equipment, and with automatic and semi-automatic lines. Output of lathes, for example, will be almost doubled by 1960, comprising at least half the total output of machine tools during the next five years. Production of multi-tool lathes will increase nearly 150%, and output of automatic and semi-automatic lines and of automated equipment will go up nearly 400%.

MORE FORMING, STAMPING MACHINES

A high priority will go to forging and stamping equipment under the Sixth Five Year Plan to achieve twice the production of this type of equipment, and to increase output of heavy presses by at least 300% by 1960. And precision forging will be more widely applied than before.

Output of modern foundry equipment, to replace manual operations and bull labor, is expected to increase by as much as 700%. Not only that, a large number of specialized foundries will be built in various parts of the country. It is hoped that a much higher output of precision castings will thus be obtained, thus saving both on metal and on subsequent machining operations.

"Automation must be widely employed in all industries. This task confronts the heavy and light industries alike. Automatic computing machines which can themselves determine the most advantageous regimen of production processes and maintain it, and also establish and control quality assignments, must play an important role in automation."

This would imply that Russia is deeply interested in applying numerical control to production. So far, it hasn't been determined whether the Soviet Union has gotten past the theoretical stage.

That brings up a pertinent question. Is Soviet research out of touch with industry? Even the Russian Report to the 20th Congress brings up the point, "A spirit of smug complacency and self-satisfaction has taken root in some scientific institutions. It would be a good thing if those institutions were swept by the fresh breezes of criticism and self-criticism, and if they went in more for creative discussion of scientific problems. This is the only way to eliminate the shortcomings which retard the development of science and, in particular, to put an end to the misguided tendency of certain scientists to act as the sole arbiters in their particular branches of science."

That is strong comment. It is, of course, not an exclusive Soviet problem.

Adverse comments to the contrary, though, Rus-

sia's scientists have succeeded in applying the principles of automation to the production of automobiles, trucks, electric motors, sewing machines and many other metalworking products.

And there is an impressive solidity about the transfer machines now being built for large components. High rates of metal removal are being achieved in milling cuts on large cast iron components. The heads on these machines are standardized and of substantial construction.

In contrast with these heavy units, standardized unit heads are also available for high-speed operation on quite small parts, using rotary indexing machines with automatic feed of the components at the loading station. Step-drilling of smaller-diameter holes at high speed is featured, too.

There is no doubt that the Soviet has come a long way in developing these machines. An example of such advanced technique is the incorporation of turning and grinding stations on lines for pistons, rings, and armature shafts.

It should be appreciated that automation means much more than transfer machines to the Soviet. The latest trends show a serious endeavor to provide flexibility in automated lines. An important trend in this respect is toward units with standard table heights that can be incorporated into a line as required, and the use of general purpose machines with appropriate linking arrangements.

Russia plans during the next five years to bring into service not less than 220 automatic and semi-automatic lines and shops. In the radio and electronic fields, extensive mechanization of, and automation of production of standard parts will be carried out. It is also planned to automate assembly of electric motors.

Considerable specialization in the production of machines is called for, and it is clear that, up till now, there has been too much duplication. The engineering industry heads the list here. It is pointed out that many ministries and departments are manufacturing vital equipment entirely outside their fields of production, and that one and the same type of machine is being produced by several ministries or departments when it could more efficiently be centralized in one.

For instance, the Ministry of Agriculture has up till now been turning out about 10% of all the metalcutting machines, and 24% of all the forming machines and presses produced in the country. Such machines, in consequence, have often been obsolete technically and production cost has been high, because they have been made in comparatively small batches, and with insufficient technological knowledge.

Because of the present lack of specialized foundries, and forging machine and press factories, large quantities of castings, forgings, dies and fixtures, and other items in large scale usage have had to be produced by individual plants, at high cost and poor quality. As already mentioned, improvements in foundry and metal forming equipment are envisaged in the next five years to overcome this situation:

"The aim must be to have every enterprise producing technically uniform products, to standardize parts and units to the maximum, and to organize their mass production as specialized enterprises."

This is not to imply that the variety of equipment available to Russian industry will grow less; on the contrary, it envisages a growth of sizes and types of product; but these must then come under strict specialization of both design and production.

It is appreciated that Russian productivity has not increased in an adequate ratio to its technology, and that this is not solely the result of inadequate production planning and engineering, but is also a function of irrationalities in the system of output quotas and wage rates—a surprising admission.

Apart from the introduction of more modern machinery, Russian productivity in the next five years will be helped by the expansion program for power supply which, it is claimed, will increase the power per industrial worker by 60%.

The brief details in the foregoing major requirements called for in the present five-year plan were taken largely as our basic terms of reference when discussing the situation with Soviet engineers.

In an interview with the Deputy Director of the Ministry of Machine Tools and Small Tools, it was confirmed that the figure of 250,000 tons of machine tools (the expected total Soviet output for 1956) is not, as first thought, totally inclusive.

Overall production is in fact more than double this figure, since it applies only to metal-cutting. Previously, there was some doubt as to whether this was so or whether the figure included forging machines and presses. It seems clear that these are not included and, in fact, forming and foundry machinery will amount to another 150,000 to 180,000 tons.

EMPHASIS ON METAL FORMING

We had confirmation, as envisaged in the report to the 20th Congress, that, during the present Plan, the emphasis will be on metal-forming machines, and a senior member of the directorate of the Ministry of Machine Tools made it clear that it is looking to such machines to make a major contribution to increased productivity. One aim, as already mentioned, is to produce more close forgings, making the utmost use of automation.

Asked whether powder metal techniques were included in this category, the Deputy Minister told us that Russia is not looking for any major developments in that field, although powder metallurgy is being used to some extent for the production of tools. The lost wax process is also exploited where practicable. Incidentally, we saw evidence of this at the Moscow United Soviet Exhibition, notably for sewing machine parts.

Shell molding, we were informed, is being used only on a limited scale. Solid crankshafts have been cast by this method, but are not in general use. "Bakelite" sand mix—the word "Bakelite" is the actual term used—is considered too expensive yet to justify wider application.

The West's embargo on machine tool shipments to the Soviet is decidedly a thorn in Russia's side.

Report on Russia . . . Part 2

Russia badly needs certain types of machine tools listed under the embargo, although officials claim it won't hold up the Sixth Five-Year Plan.

The head of Russia's export-import organization made it plain, too, that the Western machine tool makers, themselves, were not to blame. He had found them eager enough to sell their wares within the limits imposed by heavy order books. Some of them recalled the benefits of pre-war sales, he said, and the Soviet could remain a big customer. West German firms in particular, would very much like to gain access again to the Russian market.

Asked whether the Russian aim was to become self-contained as far as the production of machine tools was concerned, he replied "not necessarily." Naturally the embargo has had a bearing on Russia's attitude and, embargo or no, the Soviet is continually broadening the spread of its products.

The expansion of machine tool production under the Sixth Plan by no means represents only increased output of current types. Here are figures quoted to indicate the revised shape of the program of types and sizes, according to plan. Figures relate to the end of the five-year period.

	1950	1955	1960
Metal cutting	435	790	1,200
Presses, forming machines	99	240	500
Foundry and diecasting	25	50	120
Wood working	111	156	159

Elephant machine tools are a feature of the Russians' building program too, and steps have been taken to insure that Russia can meet demand for these machines, to some extent at least, despite the ban. Asked what the maximum sizes are, the reply was, "Any size we may need." As a guide to the order of size of machines built to date these figures were quoted: a boring mill for work up to 18 meters diameter; a planer with a table 5 meters wide by 18 meters long; a center lathe with center height of 1½ meters—bed could be any length required. What capacity Russia has for producing these large machines was not revealed.

Even so, it was explained that the Soviet would very gladly have bought these machines from the West, and also other specialized types required in relatively small quantities, because it would have taken less cost and effort, he declared. Russia, for example, was not particularly anxious to build its own machines for producing marine reduction gears. The Russians clearly appreciated the considerable know-how involved, and they could probably have used the design and production capacity to better advantage.

But, by force of circumstances the Russians had to introduce them into their program. Now, the machines being turned out are capable of doing the job.

Import and export of machine tools are handled by a State organization, Stanko-Import, which has its headquarters in Moscow. It is very clear that the Russians would like to buy if the West would sell. However, the Russians seem fairly confident that, if the embargo continues to be applied, they will be able to meet many of their needs elsewhere.

In conversations with heads of Stanko-Import, we also discussed European machines and were told that deliveries of Hauser machines were good, but delivery was slow from Société Genevoise.

One unexpected discovery during our visit to Stanko-Import was that in spite of a shortage of machine tools, Stanko is prepared to export Soviet-built ones. Inconsistent though it may seem, we were told that Stanko would export standard types, and we were quoted prices on milling machines and horizontal boring and milling machines up to 200-mm dia spindle.

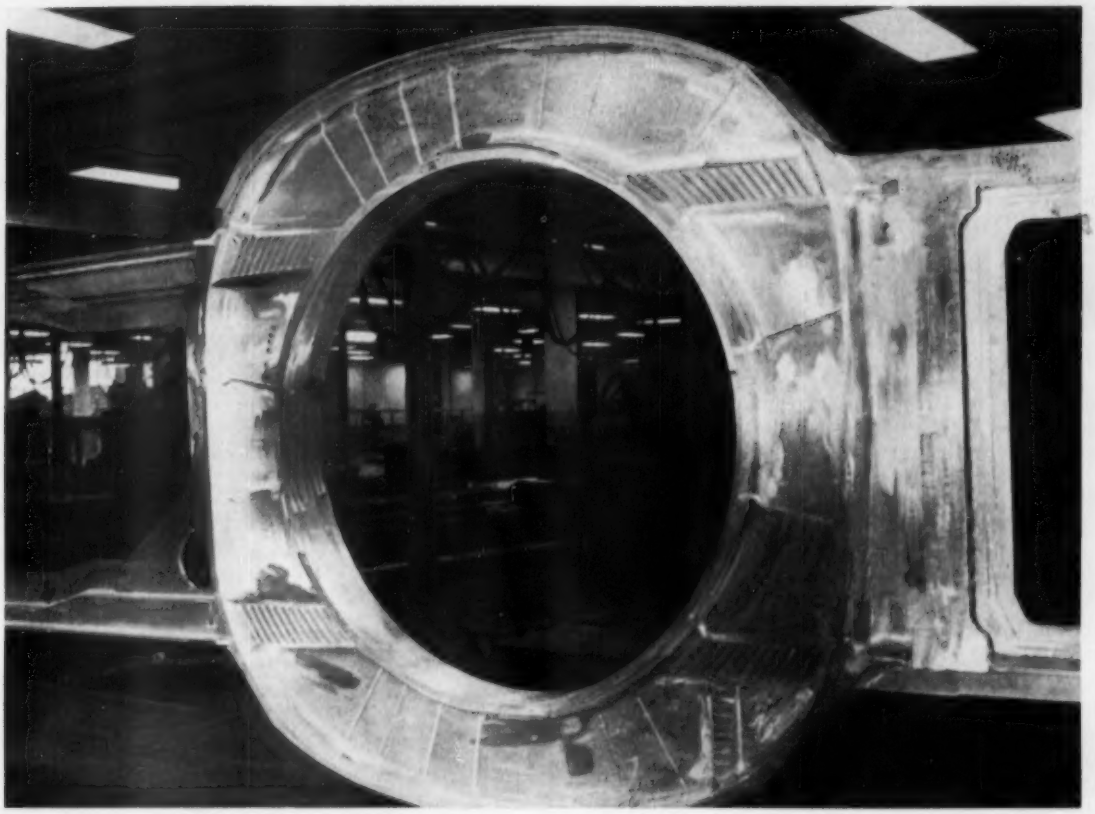
Prices, we were informed, would be "adjusted according to competition." The head of the organization, who gave us this information, added that he would be no more specific than to add that "they were also business men."

We could obtain no figure for the volume of machines which Russia would be prepared to export. Asked whether the USSR would be prepared to license its designs, he admitted that it is a possibility. Prestige is obviously one factor behind the decision to export, and, doubtless, a competitive element.

Among a complete set of catalogs, in categories, which we obtained from Stanko-Import, is a well-produced publication in English listing Soviet gear cutting machines. This includes gear shapers, straight bevel gear generators, spiral and hypoid bevel gear generators, gear hobbing machines, horizontal gear cutters, gear tooth chamfering machines, gear shavers, gear testing machines, spline hobbers, gear grinders, thread millers, thread grinders, and nut tapping machines.

The introduction to the catalog is worth quoting: "Machine tools produced in the USSR are outstanding for their high efficiency, convenience and safety in operation and long service. The first class material, perfect modern design and skilful workmanship provide accuracy, high efficiency and durability of the machine tools. Steady improvement of machine tool design in the USSR aims at the increase of productivity, accuracy, reliability and dependability of machine in operation, as well as the reduction of operator's fatigue by improving and convenient placing of all operating controls and the all-increasing automatization of operation. Stanko-Import is able to offer a wide range of machine tools, both universal and special types, including automatic transfer machines and automatic workshops."

EDITORS' NOTE: In these introductory articles, our aim has been to take some of the most important aspects of engineering and the metalworking industries in the Soviet and, considering them against the background of the past five years and the plans projected for the next, attempt to see them in perspective. Such an introduction, for reasons of space, must, of course, be fairly general. In future articles, we will be taking some of the points raised here and dealing with them in greater detail, together with practical descriptions of Soviet plants at work in a variety of fields.



Center section of finished forging . . . graphically demonstrates amount of material removed and the many different cuts necessary to accomplish the contours and the various thickness steps

Conventional machines work world's largest airframe forging

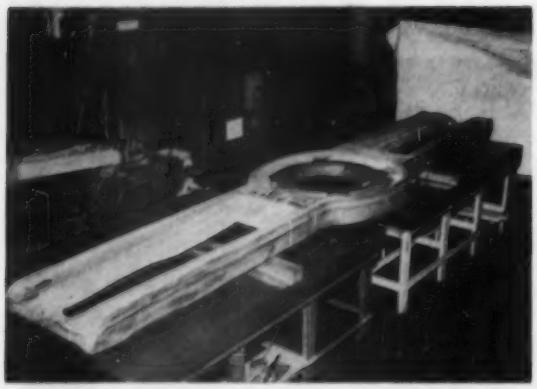
EDWARD H PARKS, supervisor, detail process planning
THE MARTIN COMPANY, BALTIMORE

Capacity to machine large forgings is a real challenge to today's aircraft industry. One answer is "elephant machines" but very few plants have them. A more convenient and immediate answer is ingenuity. Faced with a real problem on these huge forgings, Martin found the solution in typical aircraft-machine-shop equipment—millers and profilers. This experience is further proof that Industry must review its machine-shop equipment in the light of the trend to forgings of which these are the forerunners. The job is done in five major rough-machining operations before heat-treat and six finishing operations.

Blocker-die forgings are made on an 18,000-ton press by Bridgeport Brass Company at Adrian, Michigan, and weigh approximately 2,200 to 2,500 pounds when delivered. For the first operation the forging is put on a plano-mill for trimming, truing dimensions, and reduction to workable size. Next, tool-locating holes are drilled.

Machining of the center section of the forging is done on an automatic profile-milling machine. This operation requires four stages, because of the size limits of the machine. One-half of each face is machined, then the forging is rotated 180° to machine the other half. Next the

Conventional machines work . . .



Rough forging . . . made by Bridgeport Brass, was forged by the blocker-die method, one half at a time, because quantity was too small to warrant cost of special dies. Test slugs, included in center hole, are removed during processing and are analyzed

First operation . . . includes milling the surfaces, rough truing dimensions, and removing excess material. Parting line of forging determines left- or right-hand component. Cutting is done by a single-tooth carbide-insert flycutter on the vertical spindle. Insert shows second step with two simultaneous cuts: one by an endmill in the vertical spindle; the other with a butt mill in the horizontal spindle

forging is turned over and the procedure repeated on the reverse side.

Inboard legs of the spar forgings are straight and have a relatively constant cross-section. Therefore they are milled on a hand profile milling machine having a 14-inch clearance. The machine was adapted for this job by installing an additional tracer head to the left of the cutter head, to increase the range of the machine.

The outboard legs, however, are both tapered and are set at an angle from the vertical center-line of the forging. Machining this taper requires a hand profile-milling machine providing a 28-inch clearance.

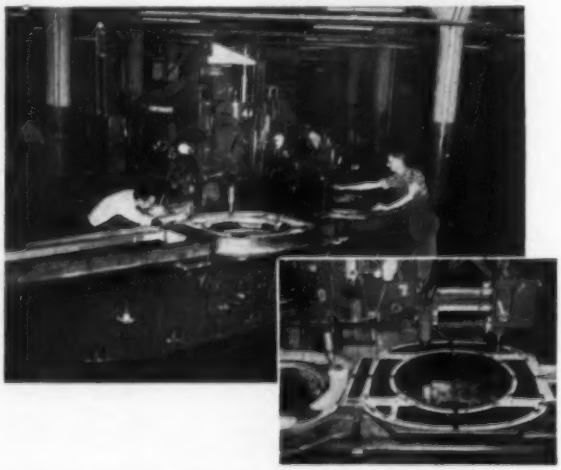
When the forging is completely roughed out, it is anodized for crack detection and sent back to Adrian for heat-treatment to the T6 condition.

Finishing operations duplicate rough-machining operations, except that they are performed to precise tolerances, and also include any straightening that might become necessary, plus drilling of fitting and attachment holes.

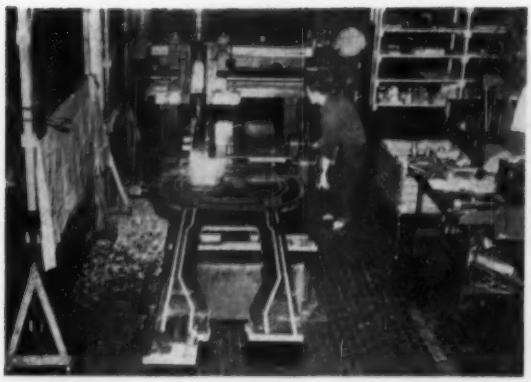
Sixty-six production tools are used in the machining operations on this forging. They include 9 holding fixtures for the various milling machines, 23 profiling templets, 2 drill jigs, and 32 miscellaneous cutters, slings, straightening-press tools, and check tools. For accuracy, a slab of one-inch thick aluminum was run through all processes to check the dimensional accuracy of the tools before the first production part was run.

After machining is completed, the fitting measures 15-feet-7-inches long, 46⅛-inches wide, and 6-inches thick. It presages a new era in airframe construction and has numerous implications for the future of the Air Force heavy-press program. This forging is employed on a relatively low-volume production airplane. If production volumes were higher, a more refined forging would become economically feasible and would somewhat reduce the rough-machining operations.

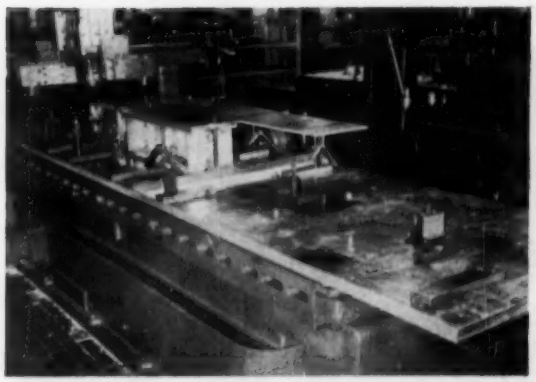
Equally as significant for the aircraft industry, machine tools normally considered adequate for normal airframe work are too small for large forging work. The tooling required for this job will be greatly reduced when machines, perhaps numerically controlled, are available to perform all the operations in one position.



Automatic profiler . . . is used to provide further stages of roughing. A 1¼-in.-dia two-lip endmill is used at 325 rpm with feed variable up to 25 ipm; also used is a 6-flute, 1¼-in. dia endmill, 6 in. long and turning at 140 rpm. Intricate templets (insert) provide the pattern for center-section recesses. Roughing ring area takes 40 hours. Templets are 1/16-in.-thick sheetiron on a steel base. Machine capacity permits only one-half of piece per setup, hence operation is done in four setups—each half and both sides. Forging is set up and four stages are coordinated around *tooling holes* at each end in ID, in scrap lugs later removed.

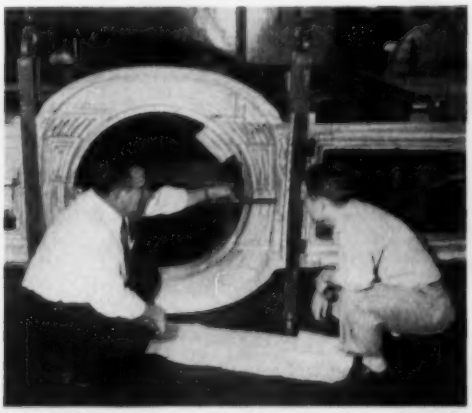


Tooling check-out . . . is done by machining 1/16-in.-deep cuts into an aluminum plate. All tools, templets, and setups were checked before being used on actual forgings. One result: Not a single forging was scrapped.

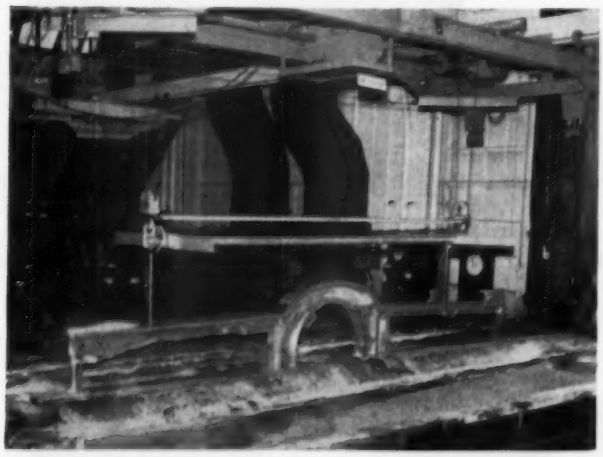


Tooling pins . . . on table of hand profiler, with everything set up on 15-in. centers, simplify positioning work. New follow block on left of bridge provides 15-in. center for follow-pin to make setup symmetrical, thus avoid flipping job over or moving it. This idea cuts setup time in half

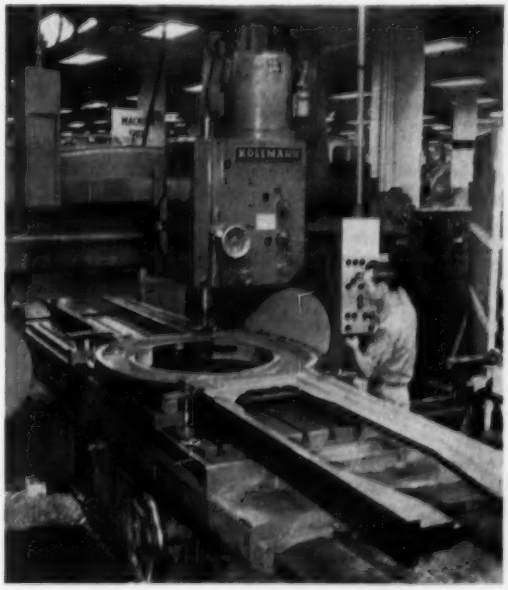
By flipping templet . . . after machining one side, operator is ready to machine the opposite side. This setup roughs the inboard legs on the 14-in.-clearance hand profiler



After roughing, . . . forging is sent to anodize to check for cracks. Special slings are provided with rounded work holders to permit flipping over without damage to machined surfaces or thin sections



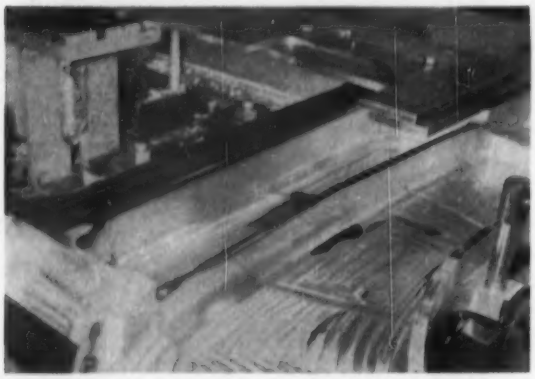
Special slings . . . are also used to handle part during anodizing. Cross-bar keeps lift straight. Aluminum tie bars and pins at end of legs keep them from spreading. After anodizing, part is returned to Bridgeport Brass for heat-treat



After heat-treat, . . . where Bridgeport Brass removed the test mass from the center hole, piece is machined top and bottom to proper thickness. Then tooling holes are opened to remove errors of heat-treat distortion. Limits are plus or minus 0.005 in. on webs and plus or minus 0.010 in. on remainder of piece, except tooling holes which are plus or minus 0.001 in.

Conventional machines work . . .

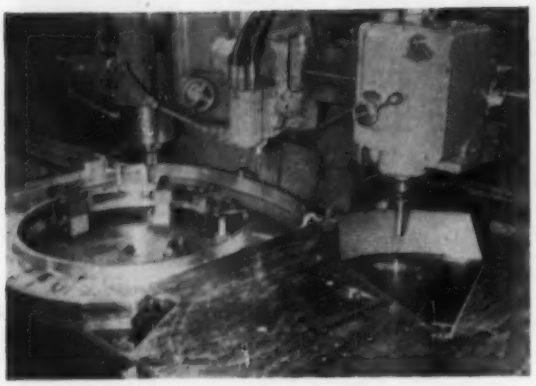
Roughed to within 1/32 in. . . . after heat-treat, center-section rim is profiled to within plus or minus 0.005 in. Before heat-treat, forging was roughened to within ¼ in. of final size



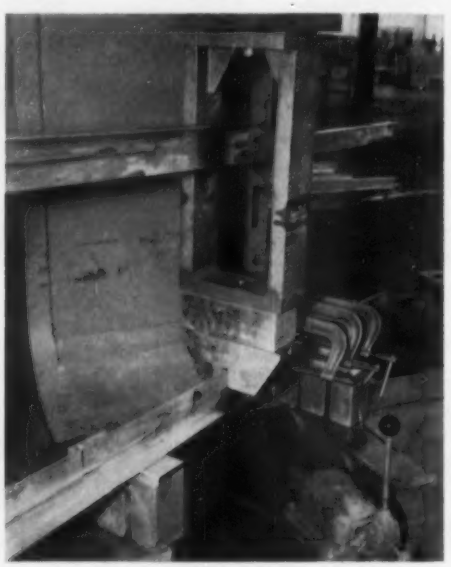
Tooling hole and locating pin . . . (lower right) are part of location technique used at each stage of machining. Ear containing hole is removed in final clean-up. Undercutting this "I" section leaves a web only ⅛ in. thick

This forging, of aluminum alloy, was specified when modification of the Martin tactical bomber, B-57, called for a larger engine. The new installation would not fit between the one-piece-wing spars of previous models. This forging permits the engine cavity to break through the normal lines of the spars, yet is capable of withstanding the increased loads of the higher-performance model. It is one method of increasing the performance of an airplane, of adapting it to improved power plants, without redesigning the entire structure.

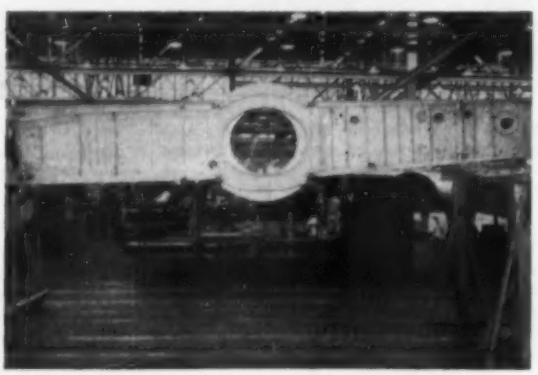
Finished forging installed . . . in wing will save 150 pounds on each ship and will replace 30 detail parts

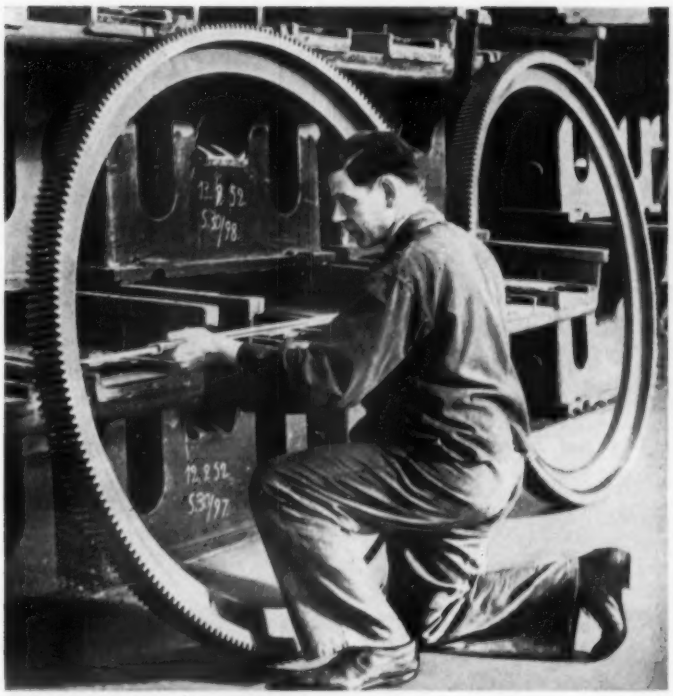


Stepped-block "stadium" templet . . . plus radiused two-lip endmill, with the tool rotated to the four required positions, is used to finish machine the bracing sections in the center section. After cutting the grooves, their tops are milled off. Although the automatic profiler would profile across the grooves, using this method avoided running into the hub

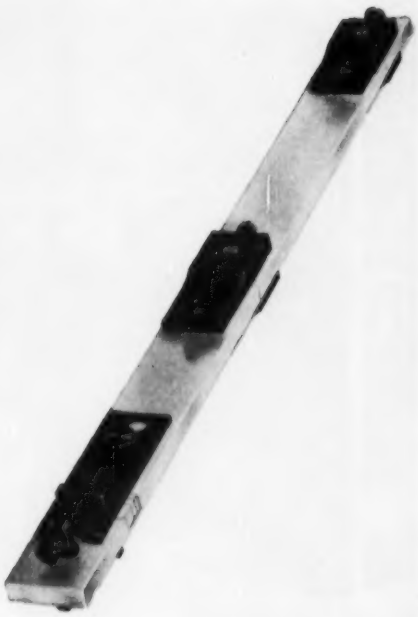


Strip heaters . . . and special heated dies are used to straighten any bends in the legs caused by stresses developed during machining. Temperature is critical, hence the proper heat must be maintained in the thin cross sections. Only limited bending is allowed





MEASURING A LARGE BORE by gage blocks combined to the wanted dimension. The end pieces have cylindrical faces. Limit gages can be built up by using two gage-block combinations. When the production run of this machine part is over, the gage blocks can be used for measuring another one



LONG GAGE BLOCKS are combined by joints and holders with 2-in. wear blocks and small gage blocks to obtain the desired dimensional reference. Spherical bolts at the joints avoid tensioning of the blocks. End faces are flat or cylindrical

How to measure large dimensions

Large bores, long dimensions, and other large work can now be accurately measured without special single-purpose gages. Long gage blocks, or gage bars, are combined up to a 50-ft length. Any wanted dimension split into 0.0001 in. can be built up by normal and long gage blocks, cutting gage costs

DR HANS W SCHMIDT, chief engineer, Research Dept, HOMMELWERKE, MANNHEIM, GERMANY

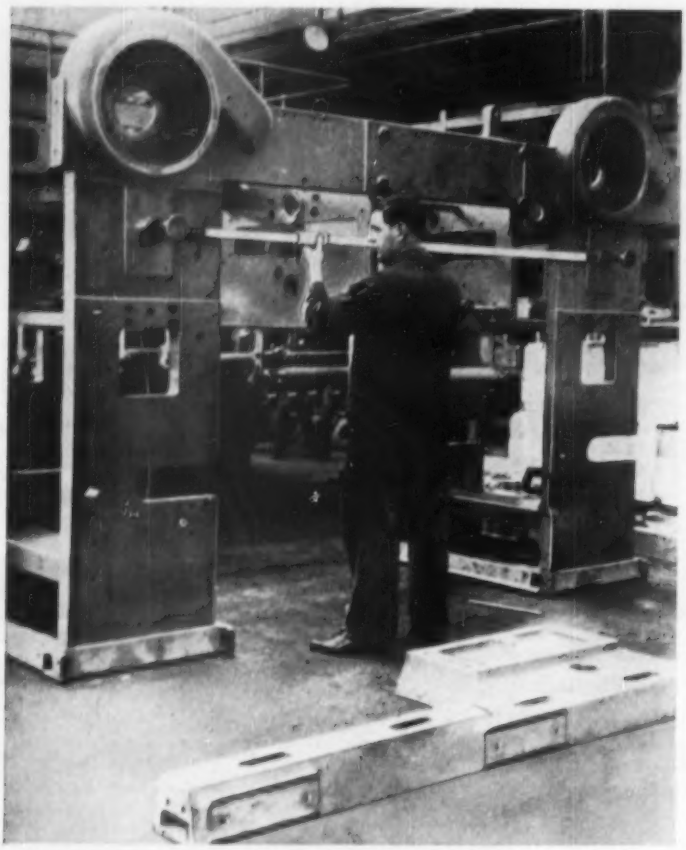
The necessity of accurately measuring dimensions from 20 in. up to about 50 ft exists in many branches of Metalworking. People in such fields as machine tools, turbines, generators, locomotives, aircraft, mining equipment, and shipbuilding are constantly called upon to maintain accurate and interchangeable dimensions and fits.

The practice of buying and storing a wide assortment of special gages is expensive and does not always produce desired accuracy. These special gages are kept in stock for a standard when spare parts or another machine with the same dimensions are to be made. If these special gages change in dimension from any cause, the basis of measurement has disappeared.

Use of gage blocks for dimensions under 20 in. has been widely accepted by industry. They can be accurately made and checked to determine condition; they can be combined easily for versatility. So they are well suited to serve as a standard.

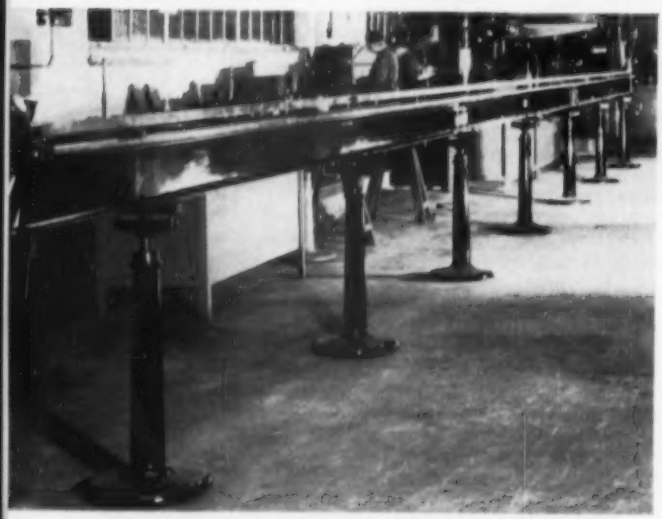
By making available to industry large gage blocks in suitable increments and with suitable accessories, the same degree of accuracy, dependability, and versatility can be extended to large work. The long gage blocks are made in one piece up to a length of 10 ft and can be combined to lengths of 50 ft and

How to measure large dimensions . . .



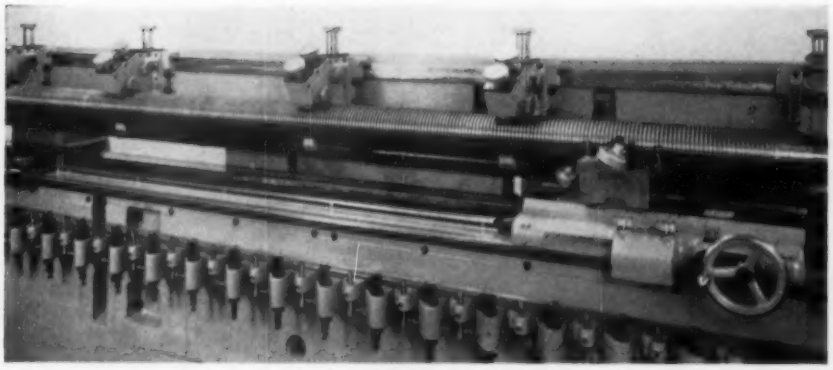
MEASURING THE DISTANCE BETWEEN TWO HOLES by gage blocks. When a large frame is mounted, the holes must be located to a precise dimension. The gage-block combination measures the distance between plugs put into the holes. The hands of the operator are insulated by leather pads

DISTANCE BETWEEN TWO OUTSIDE SURFACES on a printing-machine frame is measured with a gage-block combination with jaws. Measuring pressure is light



CALIBRATION OF A MEASURING MACHINE 50 FT LONG. The gage-block combination contains gage rods of 80 and 120 in.; total length of the combination is 590 in. Accuracy of the gage-block combination is ± .001 in.

PARTIAL LENGTH, 6 m (236 in), of measuring machine is being calibrated. The measuring slide is set by means of a microscope and rule; the dial at the fixed end is set to zero. Deviations are measured by micrometer. Combination consists of two 3-meter gage rods without wear blocks; one joint. Each gage rod is supported at two points. Supports are adjusted to the same height



LEADSCREW CHECKER IS SET BY THE GAGE BLOCKS. Precision leadscrews of Schiess AG, Dusseldorf, are measured, using gage blocks and dial indicators. The measuring slide is set at two positions in a certain distance by means of large gage blocks and a dial indicator. Readings of the lead are taken at another dial

more. The accuracy of large gage blocks follows the same formulas as those for small blocks. German Standard DIN 861 specifies the following accuracy for grade O: ± (0.000004 + length in in. divided by 500,000). Lower grades (I and II) are standardized, too. The gage bars described here are manufactured to these three grades of accuracy.

Combinations of long gage bars are made by joints and universal holders. The individual bars are changed end to end by a free-floating spherical bolt to avoid clamping distortion. Universal holders permit combining small blocks with large ones. Wear blocks of 2-in. length extend the life of the long gages and are available with plane parallel ends or radiused for bore gaging.

There is a difference in handling the smaller and larger gage blocks during gaging. The longer bars must be supported to avoid sagging. They can be laid on a plane surface or supported at several points. For lengths up to 120 in., two supports are sufficient, located 2/9 of the total length from each end. For larger lengths, two supports of the same kind for each 120 in. are provided.

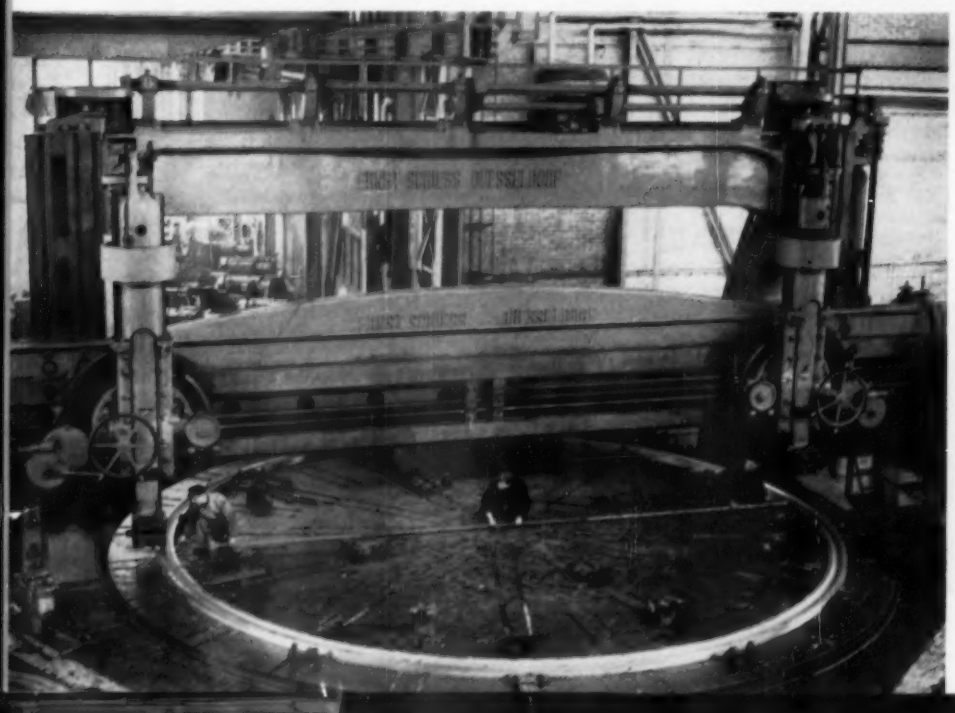
If gage bars are hand held, the holding points are chosen in the same manner. It is advisable to avoid hand contact with the bars by using leather pads or insulating means, which are available accessories.

Large bores are measured by using wear blocks with cylindrical ends. The axis of measuring pressure is in the centerline of the gage bars.

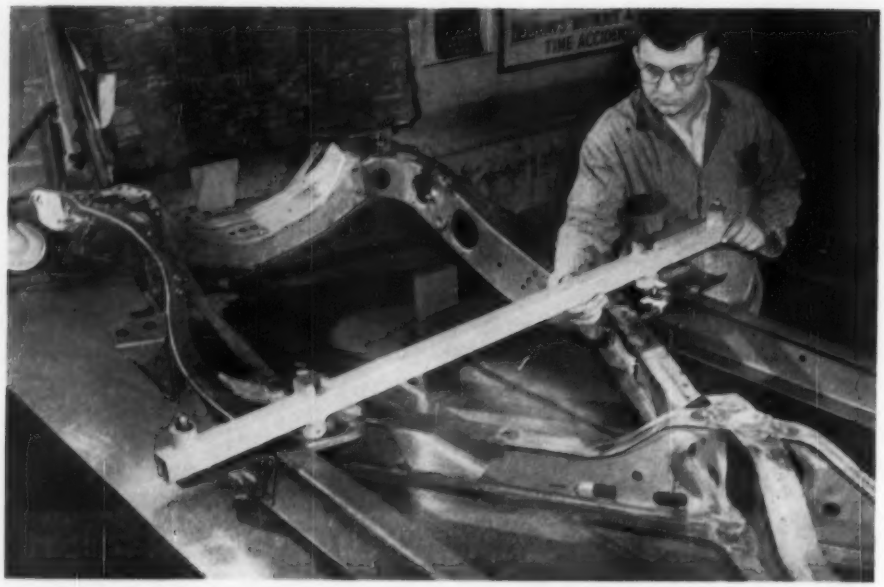
Large gage bars can also be used for setting measuring devices and comparators. Special gages for large diameters (inside or outside) can be measured with high accuracy by a length-measuring apparatus which is set by large gage bars. Workshop gages can be easily checked at any time.

The long gage blocks are made of specially selected and treated steel to avoid dimensional instability. They are shipped in storage boxes in which they are properly supported and protected.

Introduction of these gage blocks should provide industry with an economical set of reference standards and workshop standards, quickly suitable to any dimension, for use as masters or for production inspection. They have been used in the German and Swiss industries for a long time.



RING DIAMETER of 8550 mm (336.6 in.) is measured by long gage bars containing two pieces of 3000 mm each and single 2000-, 300- and 250-mm bars. Three workmen handle the long bar assembly



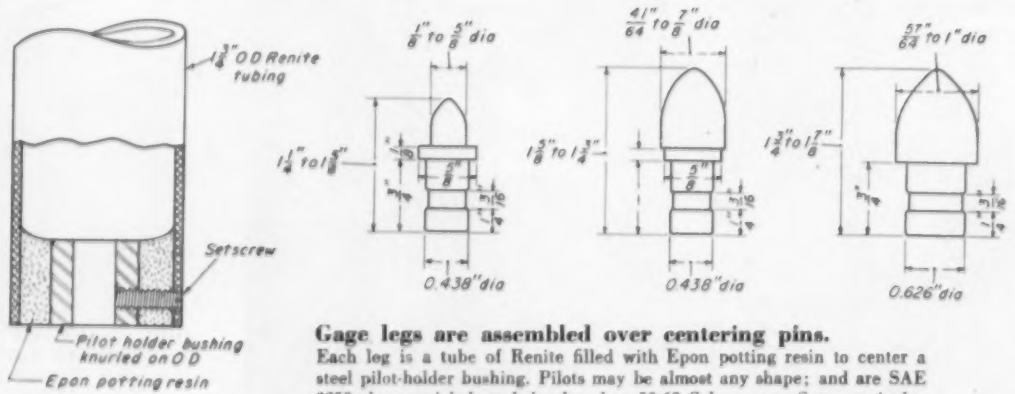
Plastic gage . . . with steel inserts weighs 5.1 lb; replaces steel gage weighing 23.6 lb. It allows one-man handling when hole spacing is checked on auto frames

PLASTIC TOOLING:

This spacing gage is light

It weighs less than a quarter of its steel grandfather's weight, but it has comparable accuracy with either caliper points or hardened pins. A spacing gage can also be fitted with four sets of gaging points, on four sides of the plastic beam; so it's economical, too

JAMES H TANNER, manager, Experimental Plastics Dep't, A O SMITH CORP, MILWAUKEE



Gage legs are assembled over centering pins. Each leg is a tube of Renite filled with Epon potting resin to center a steel pilot-holder bushing. Pilots may be almost any shape; and are SAE 3250 chrome-nickel steel, hardened to 53-62 Scleroscope. Setscrew in leg locks pilot

First gage-making step . . .
is to locate centering pins on surface plate to exact spacing required. Plastic doesn't shift as it hardens, so spacing is just the amount desired

and quick to build

Square beam . . .
is added to gage legs. Beam is a molding reinforced with epoxy resin. Joints are made with same resin plus milled glass fiber. After assembly is wiped smooth, it will harden in 12 hr

Sloppy Job . . .
A bucket of spirits, a brush, and elbow grease can get machines only fairly clean—at a cost of many man-days of unpleasant work and perhaps labor turnover

Steam "tithes"

Maintenance labor costs money. Don't fritter it away when the modern method of cleaning will get the job done in a tenth of the time. Here are facts on manhour savings in three plants

When machine tools, headers, etc, must be cleaned of thick accumulations of grease and dirt, or preservative greases such as Cosmoline must be removed from machinery that has been in storage, the cleaning task is far from easy. Thorough cleaning by hand is a time-consuming, unpleasant job.

Take a grinder, for example. Cleaning may be a regular maintenance job or to prepare a used machine for resale. Heavy layers of grease mixed with abrasive and metal particles make this one of the most difficult cleaning jobs found in machine shops. If such a machine has been used in a shop with a poor exhaust system, abrasive and metal particles may even be found in the hydraulic system.

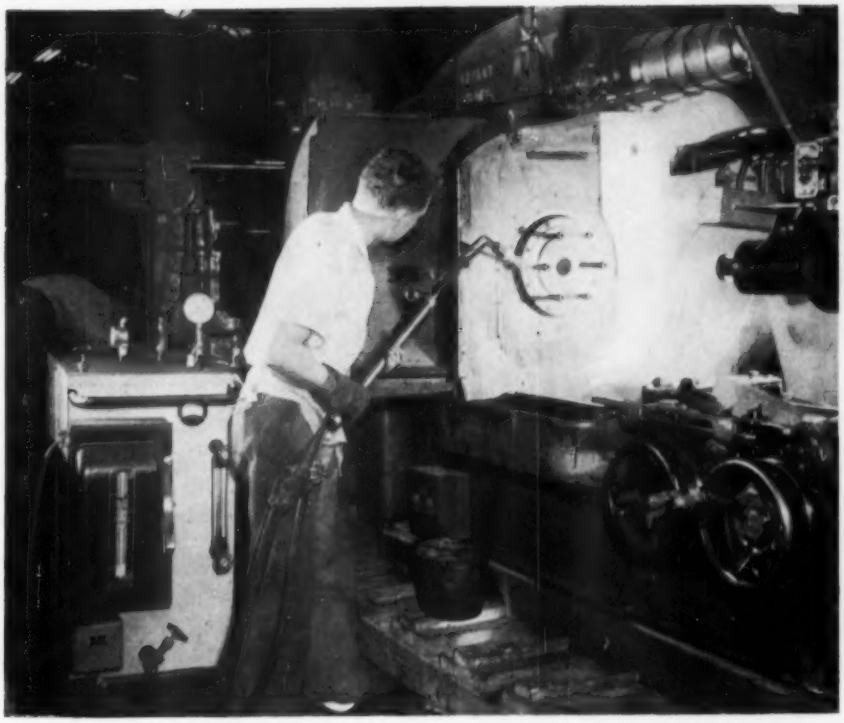
To clean the machine by hand methods would, first of all, require complete dismantling. Parts, depending on their size, would then be sprayed with spirits or washed in a bucket of spirits. After soaking, the parts would be hand scraped, even chipped, to remove encrusted dirt.

That was the way expert repairmen at the machinery warehouse of Triplex Machine Tool Corp (a New York firm that sells both new and used machines) had to clean used machines before they turned to steam cleaning. A very dirty machine that had to be completely dismantled might require as much as a month of two men's time to put it into proper condition for resale. If the machine were fairly clean and required no teardown, 2 or 3 days might be enough for hand cleaning with a mineral-spirit spray.

MACHINE TEARDOWN MAY BE AVOIDED

The application of steam-jet cleaning to such cleaning jobs at Triplex has slashed cleaning time. Machines that are torn down require only half the time. Many that would have formerly been dismantled no longer have to be; the result is an even greater saving in manhours. Fairly clean machines are now cleaned thoroughly in a day, instead of 2 or 3 days.

Triplex does some dismantling before steam cleaning. Motors and grinding heads, for example, are removed to prevent damage from moisture. The



Efficient Way . . .
A blast of steam at 175 psi soon cleans off the dirt and grease from this used internal grinder. Only minor diamantling is necessary

machine-cleaning time

machine is then brushed or sprayed with a detergent mixed with spirits. After this mixture soaks for 20 to 30 min, the machine is cleaned with steam. No detergent is added to the steam. Instead, water is mixed with the steam to flush off loosened dirt and grease. The machine is dried by dry steam or air.

NO OBNOXIOUS MIST

Working conditions with the steam-cleaning method are much better. A spirit spray filled the shop with an atomized mist that irritated the eyes and nose. On the other hand, the detergent-spirits mixture has practically no odor, and spraying it does not cause an unpleasant mist.

Experiences of other companies parallel that of Triplex. Clark Metal Products, Inc, Fairfield, Conn, had the difficult job of hand-cleaning cold headers, roll-threading machines, slotters, and eyelet machines every 6 mo at scheduled repainting periods.

Before the company adopted steam cleaning, these machines were cleaned by brush and waste with kerosene as a solvent for the grease and oil. The cleaning task was not easy because soluble oils formed resistant accumulations on the machines.

Steam cleaning, as now applied, does a better job and costs less. One man could formerly clean two machines in one day by hand. He now cleans five machines in one day and does it under better working conditions. Cleaning is done at night, weekends, or at other times when the plant is not in production. Because steam cleaning is efficient, all machines are now cleaned every 2 mo, instead of 6 mo as formerly done.

The American Brass Co, Waterbury, Conn, has used steam cleaning for similar work. Its drawbenches (this is big equipment; a medium-sized three-die bench of 36,000-lb pull may run 80 ft in length) are cleaned periodically. Soap compound used as the die lubricant, oil that lubricates the chains, and oil from the lubrication lines make for a fairly messy cleaning job. Soaking with kerosene, brushing, and scraping got the machines only half clean because of crevices that held oil and grease. Two men might work for 2 days to do only a mediocre job. But one man with a steam cleaner, it was found, could prepare a drawbench for painting in the same length of time that two men needed, by hand cleaning, for a half-done job.

ELECTRICALLY OPERATED EQUIPMENT

Operators of the steam cleaner (a Speedylectric, made by Pantex Mfg Co) approve its electric operation because there are no flames, smoke, or fumes to be hazardous or undesirable in indoor use.

Less than one hour per day is required to post average rates from time slips for 46 men on 157 cost sheets. These are balanced with payroll records in about two hours per week. Using actual rates would produce greater accuracy and would require about double the clerical effort needed for average rates

Small shops can calculate costs

Accurate cost data are difficult to establish and maintain, especially in small shops where bookkeeping and accounting help are scarce. Here's a simple system that can be refined or tailored to fit as needed

JOSEPH MENCOTTI, secretary
OVAL TOOL & DIE CORP., DETROIT, MICH

One of the big problems in operating a small or medium-size shop is the establishment of accurate cost data on which to base pricing and other policies. This problem is especially difficult for small contract jobbing shops where production volume varies and the type of work produced changes. The job can be done, but it often involves cumbersome bookkeeping operations or the operation of the shop is modified to fit some accounting system.

A successful cost system developed for a medium-size shop is based on job-order data and accumulates items of cost against particular jobs individually. This simple system is concerned only with basic requirements, but it can be employed as the framework on which to build other methods or it can be altered to suit particular conditions.

Generally, easily identified items of cost are "direct labor" and "direct material"—that is labor expended and material purchased (or withdrawn from stock) for one specific job. Here, all that is necessary is some means of quickly and efficiently listing such items of cost against the related job order. Elements of cost which cannot be easily identified against a specific job are considered "indirect costs." Some reasonably accurate and simple means of distributing these items among all jobs must be developed.

In the system proposed, a Cost Sheet is used to accumulate direct costs for any particular job. To expedite recording and to simplify reference, the sheet is designed for use in a visible binder. Direct labor is entered on one face of the sheet from time slips made out by operators and turned in daily. Direct material and any outside labor that might be ordered are entered on the reverse side daily. Under "material ordered" is listed the purchase order number and the vendor's name. This item is completed with respect to the date and amount upon receipt of the related invoice.

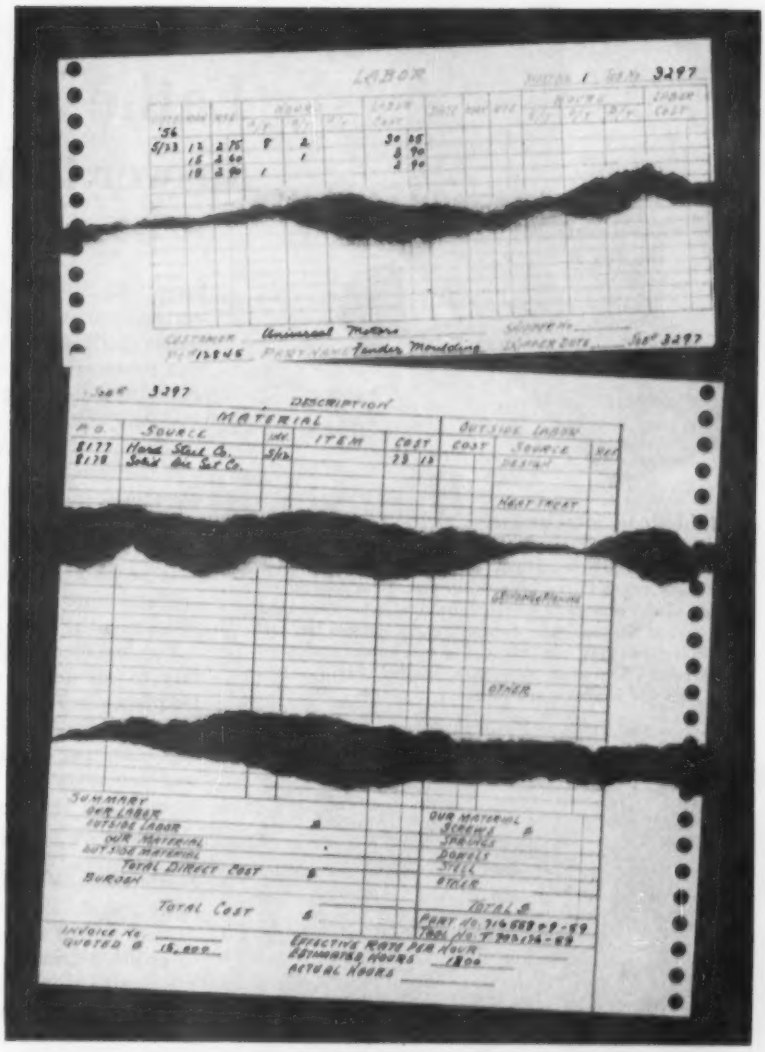
INDIRECT COSTS REQUIRE CARE

Accumulation of direct charges against a particular job under the "job order" system is a relatively simple process in any case. It is in the accumulation and application of indirect costs (overhead), that small shops often develop inaccurate data or build up costly office procedures. Usually shop overhead items include:

- Indirect labor
- Employee benefit plans
- Taxes
- Insurance
- Depreciation
- Rent
- Utilities
- Supplies
- Maintenance
- Tools

Some of these items vary with the volume of work, others will vary on a different basis, and a few will remain fairly constant. Main idea is to find a reasonably equitable method of distributing these costs over the various jobs in a shop.

The procedure should begin with a review of the previous year's accounting to determine the accuracy of the figures applied to shop overhead items. Next step is to arrive at a realistic estimate of the number of productive hours of labor to be sold during the coming


LABOR

3297

'56 5/23 12 2.75 8 2 30.25
16 2.60 1 4.90
18 2.90 1 2.90

CUSTOMER Universal Motors
PART NAME Fender, Moulding
JOB 3297

JOB 3297

DESCRIPTION

MATERIAL

P.O.	SOURCE	QTY.	ITEM	COST
8177	Hard Steel Co.	5/lb		23.12
8178	Solid Bar Steel Co.			

OUTSIDE LABOR

COST	SOURCE
	PLATING
	HEAT TREAT
	GRINDING
	OTHER

SUMMARY
DIR. LABOR $
OUTSIDE LABOR $
OUR MATERIAL $
OUTSIDE MATERIAL $
TOTAL DIRECT COST $
BURDEN
TOTAL COST $

OUR MATERIAL
SCREWS $
SPRINGS
DOWELS
STEEL
OTHER
TOTAL $

PART NO. 316689-89
TOOL NO. T 305134-89

INVOICE No.
QUOTED @ 15.000

EFFECTIVE RATE PER HOUR
ESTIMATED HOURS 1800
ACTUAL HOURS

Direct labor cost is entered on one side of simple "cost sheet," including date, operator's number, rate, and straight and overtime hours spent on the job. Indirect labor costs are entered on reverse side. Farm is prepared by company personnel and reproduced by offset printing. Larger shops may be able to use average rates to simplify bookkeeping and expedite entries

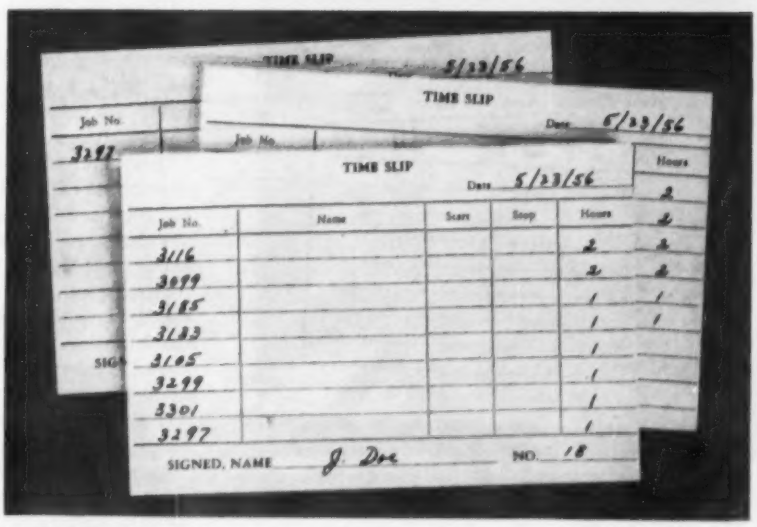
year. These hours are then divided into the past year's manufacturing expense (adjusted to reflect known changes caused by current conditions) to arrive at an hourly overhead base rate:

$$\frac{\text{1955 expense}}{\text{1956 est hrs}} = \frac{160{,}000}{120{,}000} =$$

$1.333 per hr overhead base rate

To check the accuracy of the figures developed this way a similar computation is made monthly during the current year using actual production hours worked and actual expenses incurred. Wide variations should be investigated and will usually be found to result from seasonal changes in the hours worked, or inaccuracies in accounting.

This system can serve as a basis for the numerous refinements necessary in applications containing several burden centers or those running at considerably higher volume levels. It also works well as a starting point in determining the competitive position of a shop and in establishing the degree of flexibility that can safely be brought into pricing policies.


TIME SLIP Date 5/23/56

Job No. 3297

TIME SLIP Date 5/23/56

Job No.

TIME SLIP Date 5/23/56

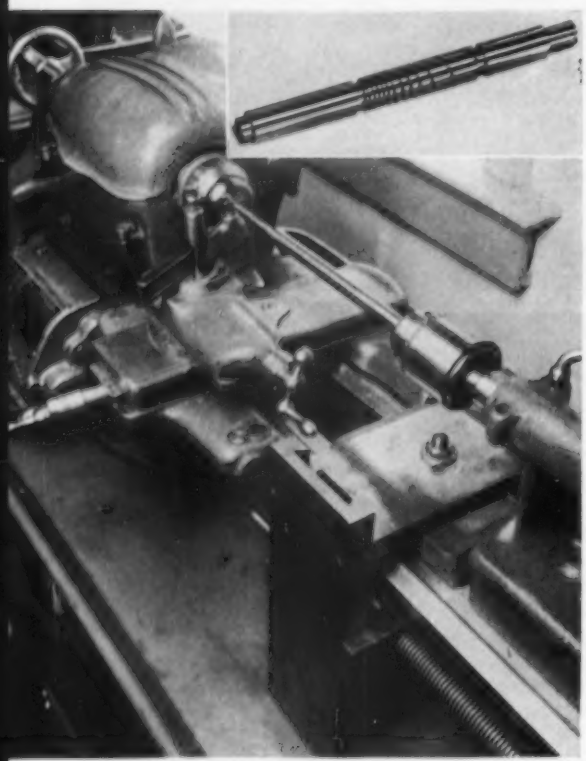
Job No.	Name	Start	Stop	Hours
3116				2
3099				2
3185				1
3183				1
3105				1
3299				1
3301				1
3297				1

SIGNED, NAME J. Doe NO. 18

Hours: 2, 2, 1, 1

Daily time slips filled out by all operators provide data for cost sheets. Job numbers, hours spent on each job, name, and clock number are all that's required

Variable-lead attachment . . .
contains a sliding cam plate, constrained to move only vertically. It is driven up and down by engaging a rack to a pinion keyed to the lathe leadscrew. Cam contour on the side of the cam plate moves upward at a constant rate, bears against the toolholder carriage, and displaces the carriage sideways, thus controlling the non-linear motion of the carriage. Replacing cam with pivoted bar provides linear lead for non-standard threads



With apron removed . . .
from lathe, attachment is clamped to bed and cam-follower rod is attached to lathe carriage. Insert shows sample screw. Screw pitch is determined by cam contour

Lathe attachment . . .
answer to non-linear thread

Essentially, this simple lathe attachment consists of a vertically moving cam plate that bears against the toolholder carriage and moves the carriage horizontally. It was designed by the National Bureau of Standards for use with a standard lathe and the lathe is not altered in any way, although it is often desirable to remove the apron before the attachment is rigidly locked to the bed.

If the cam curve of this attachment is shaped correctly, the resulting screw thread makes it possible to achieve a response directly proportional to screw rotation even when the functions are non-linear. Similarly, it is possible to accelerate or decelerate a motion at a predetermined rate. Cams are readily replaced in the attachment to suit various job requirements.

For instance, the setup originated when it was necessary to cut drive screws for permeability-tuned radio-frequency inductors. Design considerations required the tuning dial to be as linear as possible for maximum reading ease, yet to achieve such linear representation it was necessary that the tuning inductor be wound uniformly and the slug displaced non-uniformly.

Maximum vertical dimension of the cam is limited by the vertical travel of the cam attachment. The useful portion of the contour is selected at about 90% of the total travel. Two arbitrarily shaped cam sections, one at each end of the useful portion of the curve, are added to provide time to allow the lathe operator to back out his cutting tool and to reverse the lathe. As the threads engaged by these end sections are never used for control, their outlines are not important.

Using the design information to determine the number of revolutions required, the gear ratio between the headstock spindle and the leadscrew is set to a value that will displace the sliding cam plate about 90% of its maximum possible vertical travel for the desired number of revolutions of the screw blank.

This vertical distance is divided into as many equal increments of length as there are increments plotted on the required curve. The horizontal component of the contour is, of course, determined from the length of the screw to be cut.

Horizontal and vertical coordinates, appropriately scaled to the dimension of the cam, are plotted on the cam blank. As soon as the contour is machined, the cam plate is fastened to the attachment, where it is ready to guide the carriage in cutting the thread.

If a straight, pivoted bar is used in place of the cam, the attachment becomes another useful shop tool. By adjusting the slope of the bar and clamping it in place at the appropriate angle, it becomes a cam surface that permits cutting any non-standard linear screw-thread for which gear ratios in the lathe are not available.

Round Table

"Let the Kid Clean Up"

"Did you ever hear of making apprentices clean up machines and benches after older workers have finished with them, Ed?"

"It's funny you should ask that, Al. It's an old practice that's just about died out. Cleaning up the machines used to be part of an apprentice's regular duties, but nowadays they're too proud to do that kind of work."

"It's not just that, Ed. Apprentices are too busy learning new skills nowadays. We can't spare them for work that anyone can do. Actually, every man should clean up his own mess—it's only fair."

"I suppose so, Al. Of course, it would give the skilled mechanic more time to do actual work. By the way, what brought this up?"

"Oh, I just got a big argument from Wells. He's a real old-timer, you know; but I'd always thought he was just naturally sloppy. It turns out he's been expecting an apprentice to follow him around, cleaning up his dirt, all along. I told him where to get off."

"That's tough on a man who's been used to doing things one way for many years, Al. You know; we might save Wells some trouble, and some of the other skilled men, too, by hiring a sweeper to do nothing but clean up machines and benches. After all, a big part of cleanup here is removing chips, and that usually gets special attention anyhow."

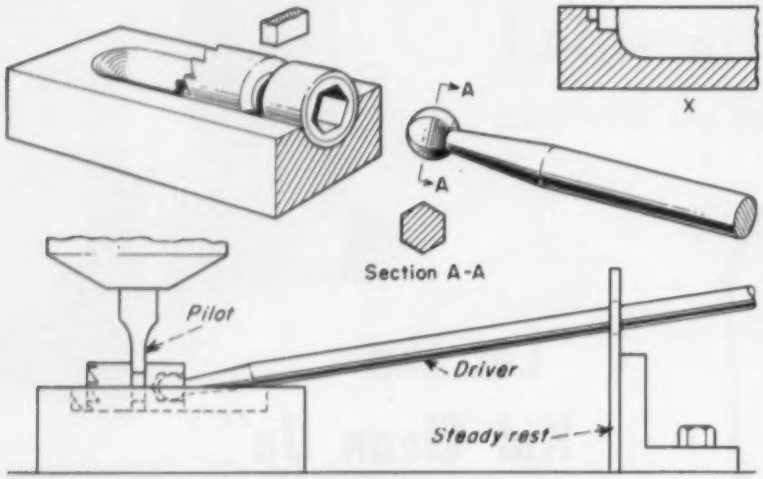
"I can't see letting a man do his job, and make a mess, without making him clean up, Ed. It just doesn't seem right."

"Well, that's usually the right approach, Al; but in this case it might be smarter to get more working time out of skilled men, and let a non-skilled man do the cleanup."

"It's like letting Wells get away with something, Ed. I think he's dead wrong, and should be set straight."

***SHOULD** skilled mechanics and tool and die makers be relieved of the chore of cleaning up chips and dirt? How many shops nowadays use the old system making apprentices clean up? Or is "clean up your own mess" the only decent way? Your ideas on the subject may help others. Discussions of earlier topics start on page 226.*

Practical Ideas . . .



Tough Diesinking Job Made Easy With Auxiliary Cutter

We specialize in die-casting dies and plastics molds, and we often run into unusual problems. One that often gave us trouble in the past was sinking an impression with blind ends—such as a half-cylindrical shape.

The old way was to mill most of the impression with a ball-end cutter, which we still do. Then, to get the ends right, we made up a punch of special shape. By chipping, scraping, and chiseling, we usually managed to finish the job.

All this miserable work has been eliminated by cradling small auxiliary cutters in the main section of each impression, as illustrated above. Such a cutter can be driven by a bell crank or by any other handy power source.

Let's assume, for the purpose of illustration, that the die requires a half-cylindrical shape with a diameter of ¼ in. First step is to sink a ¼-in. ball-end cutter to ⅛-in. depth in the work and mill both ways to the end limits. Then the special cutter is laid in the groove, facing the end to be squared up. It is held in position by a pilot mounted in the spindle of a milling machine, on whose table the setup is made. This pilot has a flattened end that keys into a groove turned on the OD of the special cutter.

The pilot acts both as a holddown and as a feeder, because the table can be moved to feed the work against the cutter, which is held firmly by the pilot.

Any number of end shapes can be produced in die or mold impressions, as shown in figure X above.

Cutters can be made easily. On small ones, the hex socket must be drilled and broached, but larger cutters can be fitted with socket-head setscrews. The slot for the pilot is cut about half way down the cutter, and the end is formed and flute-milled. The cutter is hardened all over.

The driver is a length of drill rod with a hexagonal ball on the end. This fits the hex in the cutter, but will allow universal motion as the two rotate. A steadyrest fitted with a drilled plate serves to support the driver.

As set up on the mill table, the rig works this way: The cutter is set in the impression, the pilot is located in the recess around the cutter, and the cutter is rotated. Slow feeding moves the machine table along, making the cutter work to depth.

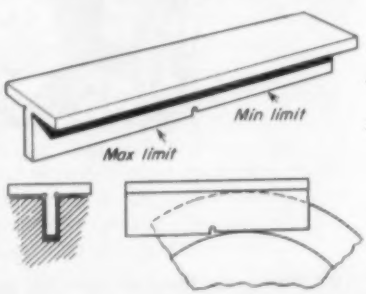
Torsten Anderson, Brooklyn, NY

Gage Simplfies V-Groove Machining

The manufacture of V-groove pulleys is a large part of the work in our shop. It has been consistently troublesome in the past to make gages for checking the minor diameters on these pulleys. This has been largely based on the fact that not many pulleys are of the same size, and each new pulley would have to have a new gage.

The gage I designed, although primarily meant for gaging the depth of roughing cuts with a cutoff tool, serves well for checking the finished depth of a groove once the OD has been established.

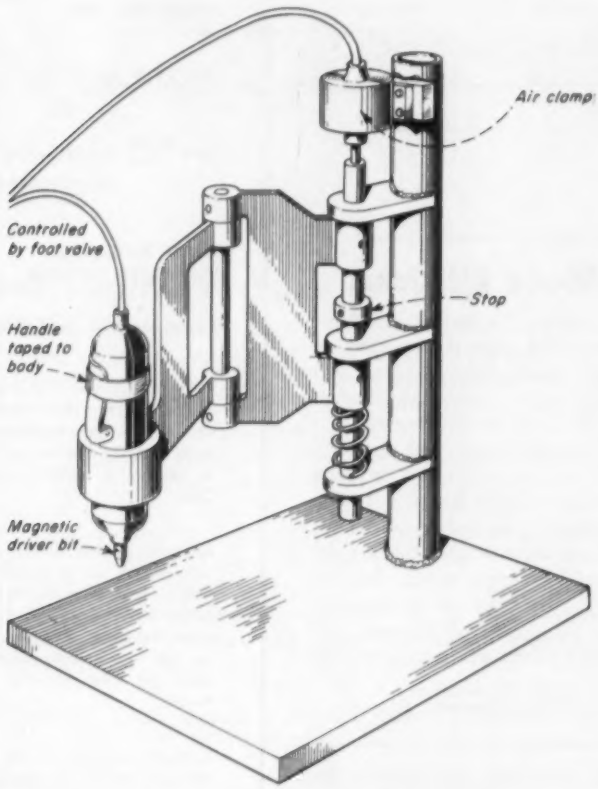
The gage resembles a 3-in. length of T-bar, and has two heights: maximum and minimum limits. The top, or the bridging section, is made in widths to suit the different applications, i.e. the



deeper the groove the wider the bridge. The depth-gaging section is made slightly thinner than the width of the cutoff tool used, to assure freedom when gaging. A relief is cut in each inside corner to remove any roundness, and to establish contact with the OD of the pulley if burrs have been raised by the cutoff tool.

A selection of these gages covering as many V-belt sizes as possible will prove to be a valuable asset to any toolroom doing some V-belt work.

Berton J Leavitt, Lincoln, Neb



Air-Powered Screwdriver Rigged for Higher Output

The radial-arm-mounted, air-powered screwdriver illustrated has increased production and made handling parts and driver easier. We have built several of these devices to reduce operator fatigue and to improve quality of driving several sheet-metal screws on medium-size assemblies.

The tool consists of a base on which is welded a column. On this column are welded three lugs to accommodate the vertical shaft holding a two-piece radial arm. The arm is located on the shaft and fastened to it by means of set-screws, permitting motion only of the shaft through the lug holes. A compression spring, located between the bottom lug and the lower part of the arm, suspends the weight of the arm and the driver, which is held in a bushing on the end of the arm.

Mounted at the top of the column is an air clamp cylinder. It is there to supply the downward force on the shaft and arm when an air foot valve is opened. An air-regulating valve is used to separately control the amount of air fed to the cylinder. The air valve trigger on the screwdriver is taped down to keep it in open position at all times.

In operation, the parts to be assembled are placed in a fixture mounted on the base. A screw is placed on the magnetic driver bit, and swung into position directly above the hole into which the screw is to be driven. The arm is then pulled down until the screw enters, and the foot valve is depressed, driving the screw under pressure.

This device maintains a vertical hold on the screwhead, eliminating skidding of the driver which often causes marring of finished assemblies.

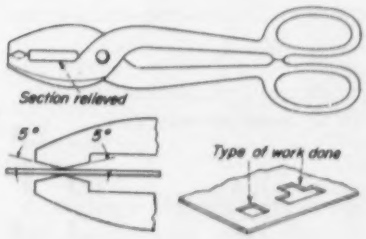
James W Bowler, Lockport, NY

Rotary Table Used To Grind Radius

A recent order in our small shop called for several parts that looked like halves of doorknobs. It wasn't too difficult to machine them with a form tool, even though tolerances were close. But after they had been chrome-plated, they had to be ground to tight limits.

Without exactly the right equipment, this might have been a tough job. But we set it up this way: We added a rotary table to a Bridgeport miller, and made a nest that would hold the part in the collet of the horizontal head attachment. A hand grinder was mounted on the rotary table so its wheel was off the rotary table center by the amount of radius required. Then we rotated the work, operated the grinder, and swung the rotary table back and forth.

Samuel Seeman, New York, NY



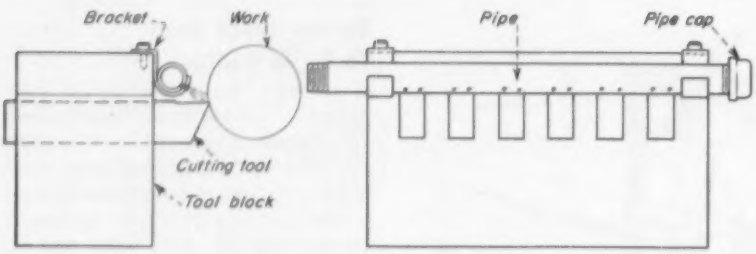
Modified Shears Cut Square Holes

On a job recently completed we had to cut some holes near the corners in sheet-metal parts. These holes were seldom uniform in size or shape. They would be square, rectangular, or T-shaped. A punch die was not considered because of the hole shapes and also because the job was not big enough to warrant it.

A punch substitute was made from a pair of hand shears. The cutting edges were ground away in the back sufficiently to clear both sides of the metal. This left us a ½-in. cutting edge with sides ground to start cutting action in the center. We found this design to cause the least amount of distortion of the metal.

Frank F Humbarger, Indianapolis, Ind

Practical Ideas



Concentrated Coolant Is More Efficient

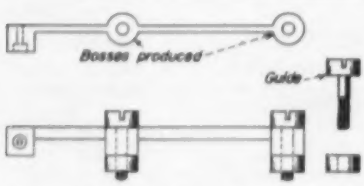
A concentrated flow of coolant is very important in multiple-tool setups on production lathes. The more concentrated the flow, the better finish and accuracy will result; and with less cutter failures.

The device I use is a simple one. It's an ordinary length of pipe, threaded at both ends. A series of holes is drilled to concentrate the coolant where it will do the most good. The holes should be small enough (about 3/32-in. dia) to produce a good spray.

One end of the pipe is capped, and the other end connected to the coolant supply by means of a flexible hose. The pipe is mounted on the tool block with straps, and with the spray openings located above the tools as illustrated.

This arrangement has the advantage of versatility. The pipe and hangers can be stored with the block while running a different job. A considerable amount of time can thus be saved when the job has to be run again. Instead of hunting for pipe and fittings, you have the coolant piping right with the job.

Roger Isetts, Kenosha, Wis



Bosses Formed With Help of Guides

Oddly shaped parts and round bosses such as the ones shown can easily be made with a file if a guide is used. Although these guides are case-hardened, there need not be any damage to the file if a little care is used.

The guide is made in two parts: A screw with a head of the diameter or shape wanted, and a nut of equal size.

The work is laid out and machined as usual in all sections where milling or shaping can be done. The holes are drilled to receive the guide screw. They should be no bigger than to allow a snug fit. If larger holes are specified for the finished part, they can be opened up later.

Fit the guide onto the roughly formed boss by inserting the screw through the hole and tighten the nut on the other side. Held in a vise, the boss is filed until the file touches the guide. Before removing the guide, a little polishing may be desired and is easily done with a piece of abrasive cloth supported on a file.

Michael Blake, St Louis, Mo

Coolant Extends Life Of Saw Blade

Blade brushes in a number of bandsaw types collect chips as the blade runs past. Eventually a mass of chips will accumulate to burnish the blade, dulling it, and may finally cause breakage. It is sometimes possible for this mass to break loose and wedge between the blade and drive wheel, causing blade to snap.

Coolant line may be tapped and a small line run over to the blade to wash blade after it has gone through the stock. A blade so washed will not carry chips around up and over to the blade brush. The result has been a much longer blade life.

Fred Schultz, New Rochelle, N.Y.

Winner No. 259

OTTAVIO CERULLO

won $25 in addition to regular payment for his idea:

JAWS INCREASE CAPACITY OF VISE

In the issue of Sept. 24, 1956

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

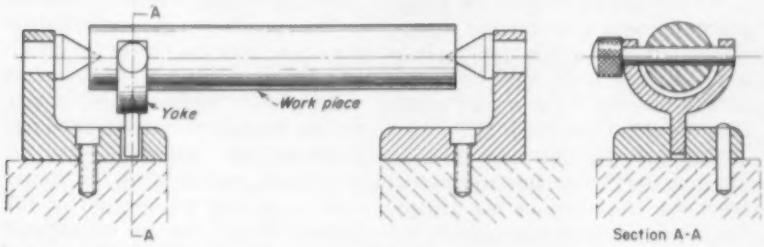
PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



Flat-Grinding Fixture on Vise

Two flats had to be ground on opposite sides of short lengths of shaft. They had to be parallel to each other and to the axis of a hole through one end of each shaft. The object was to make a fixture that would be fast to operate, yet accurate.

The shafts had been ground on centers in a cylindrical grinder, so we could depend on their concentricity. A hole was drilled and reamed through the center of the work at an arbitrary distance from the end.

This gave us a pair of points to work from, allowing us to make a relatively simple fixture.

Two short lengths of structural angle iron were faired up by grinding to form the end brackets. Into each of these was pressed a hardened center at equal height from the base. A yoke was made with a hole carefully drilled and reamed for the indexing pin. This pin has to be parallel with the base when inserted through the yoke and workpiece.

The brackets were drilled for bolting and pinning to a grinding vise. Through one of the brackets was milled an elongated hole for the leg of the yoke. This was to run with the axis of the shaft, compensating for any discrepancy in the depth of the center hole.

To use the fixture: The indexing pin is inserted through the yoke and shaft. The leg of the yoke is placed in the elongated hole, and the shaft put on its centers as the vise is tightened.

One flat is thus ground to its proper dimension, and the procedure is repeated for the opposite flat.

Frank L Rush, Columbus, Ohio

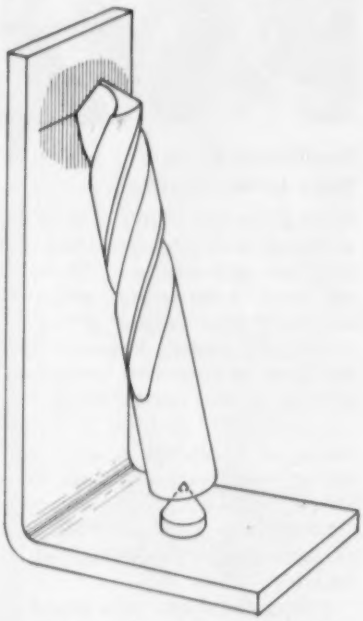
Prick Punches Replace Pierce-Punches

We produce a lot of sheet aluminum aircraft parts, often in low quantity orders. For these we build what we call an economy die in place of the usual class "A" die. We use ⅜-in. steel plate and flame harden the cutting edges. They are fastened to boiler plate, or equivalent backing, and mounted on a universal die set. The parts are usually stripped by cork or rubber.

However, when the thickness of the parts is as much as ⅛ in., we have difficulty stripping them, particularly if they have pierced holes. We didn't feel we could spend more time or money on additional tooling, so we solved the problem in the following way:

We made and inserted prick-punches in the upper half of the die, and removed the pierce-punches in the lower. When the parts were blanked, small indentations were made on them. In this manner the parts could be drilled, locating from these marks, realizing a saving over a more expensive die.

Paul L Krueger, Morton, Penna



Drill Gage Checks Flute Length

We use this gage in our shop, and find it especially handy to use on larger drills. It helps us to maintain the cutting edges alike without the use of a drill-grinding attachment.

The gage consists of nothing more than a piece of ¼ in. x 1½-in. CRS bent to a 90° angle, and a center pin pressed into the base.

To use, simply chalk or paint the area with lay-out blue where the drill point will touch. Allow one of the corners of the drill flute to make a mark. Rotate the drill 180° and compare the length of the second flute with the mark previously made.

This procedure will instantly tell which of the two flutes is the longest and must be ground. When both flutes have been ground to equal length, and same angle is maintained on both, this drill will cut to size.

L O Luberg, Fairfield, Conn.

Practical Ideas

Hardwood Block Stops Lathe Chatter

Some of the lathes in our shop are equipped with follower rests, but each has only two jaws. These do not seem to be enough when an unusually long turning job is involved. No matter how carefully the jaws are applied, vibrations will set up and chatter result.

I solved this problem by introducing a hardwood block under the work, erasing vibration completely. A block like this can be bandsawed in a couple of minutes, so there's practically no cost or time lost.

It is sawed out to form a landing slightly larger than that on a metal jaw. The base is not perpendicular to the straight front, but cut at an angle, matching that of a wedge, to create a means of height adjustment.

The wood, being porous, serves as a reservoir for the lubricant applied, reducing the chances of scoring the work. It's a good idea to apply oil frequently to the block until it is saturated and is then self-lubricating.

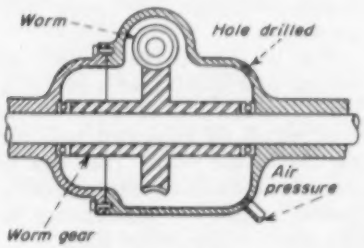
H J Gerber, Stillwater, Oklahoma

Air Prevents Drill Chips from Entering Gear Housing

After we had finished fitting up several gear housings, we found we had left out the hole for the lubrication fitting. We didn't want to undo all the fitting work we had completed during assembly, but the hole had to go in. It was over a worm gear that would be covered with cast-iron chips as we drilled.

We thought of turning the whole assembly over and drilling upside down, but some chips would get in anyhow, and we'd have to probe with a magnet. Even so, we probably wouldn't get them all.

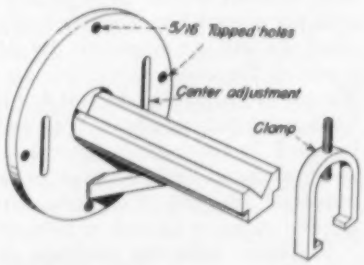
Then we got the idea of using air pressure inside the housing to blow the chips out as we drilled. There was a completed hole on the opposite side of the casting that we had remembered to drill, so we used that as an air inlet. We used 90 psi air as we drilled right side up, and it worked just fine.



We drilled carefully, especially at breakthrough, and the air blew the chips out as they were cut. We were also able to tap the holes the same way. The use of goggles is a must while doing this work.

When it's a large hole, a small pilot hole should be drilled through first to allow air to blow past the point of the full-size drill as it cuts. On our castings the hole used for injecting air was pipe-tapped. Any threaded hole will work as well if a special screw is made with a hole drilled through it.

R G Caviani, Iron Mountain, Mich



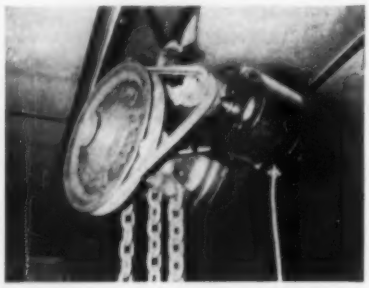
V-Block Grinder Fixture Holds Off-Standard Parts

My assignment recently included the cylindrical grinding of off-standard parts. The OD's were under or over the standard collet sizes, so they could not be accurately chucked. Neither did the pieces have any centers to swing them on.

The illustration shows the fixture I made to hold the pieces for grinding. It consists of a ½-in. faceplate with a 6-in. diameter and a hole in the center to take a modified V-block. An elongated hole is milled on each side of the center hole to permit adjustment of the fixture. Four holes are drilled and tapped through the plate for setscrews, providing for further adjustments.

The V-block is welded into place, through the center hole, as perpendicular as possible to the back of the plate. A brace is welded in under the V-block for additional support. A small clamp for holding the work completes the fixture.

L D Fladby, Toronto, Canada



Chain Hoist Motorized Economically

In our line as specialists on farm equipment repairs, the chain hoist plays a vitally important part. However, though they are great labor-saving devices, even hand-operated hoists, when used often, can add up to a lot of labor.

We have made things a whole lot easier for ourselves by motorizing our chain hoists.

We use a 1/3-hp, three-phase motor, rated at 900 rpm, mounted on a bracket and fastened to the hoist. In place of the pullchain, a V-belt is used. It runs in the original chain pulley, which does not seem to subject the V-belt to any undue wear.

While we did not incorporate a brake on our rig, it may be advisable on some applications. We use a three-phase reversing drum switch, big enough to be used for plugging, to give us immediate stopping action.

Harry J Miller, Sarasota, Fla

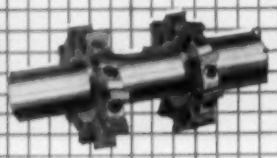
120 H.P.— MILLING SLOTS

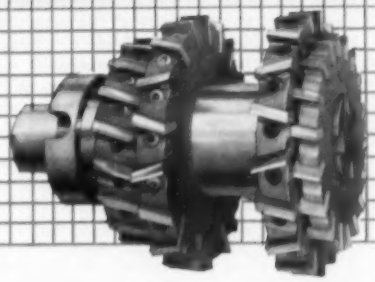
1¼" WIDE, 3¼" DEEP, 20" FEED

This unusual operation with 24" Ingersoll carbide inserted blade slotting cutters is an example of the kind of experience we draw upon when recommending and building arbor cutters for slotting and straddle milling on either light or heavy machines. Cutters of this type are made as small as 4" x 3/8".

Ingersoll cutter engineers are available to help you multiply returns on large investments in production machinery with efficient tooling.

Have you compared the economy of replacing a set of inserted blades instead of buying a complete new solid cutter? The saving is substantial.



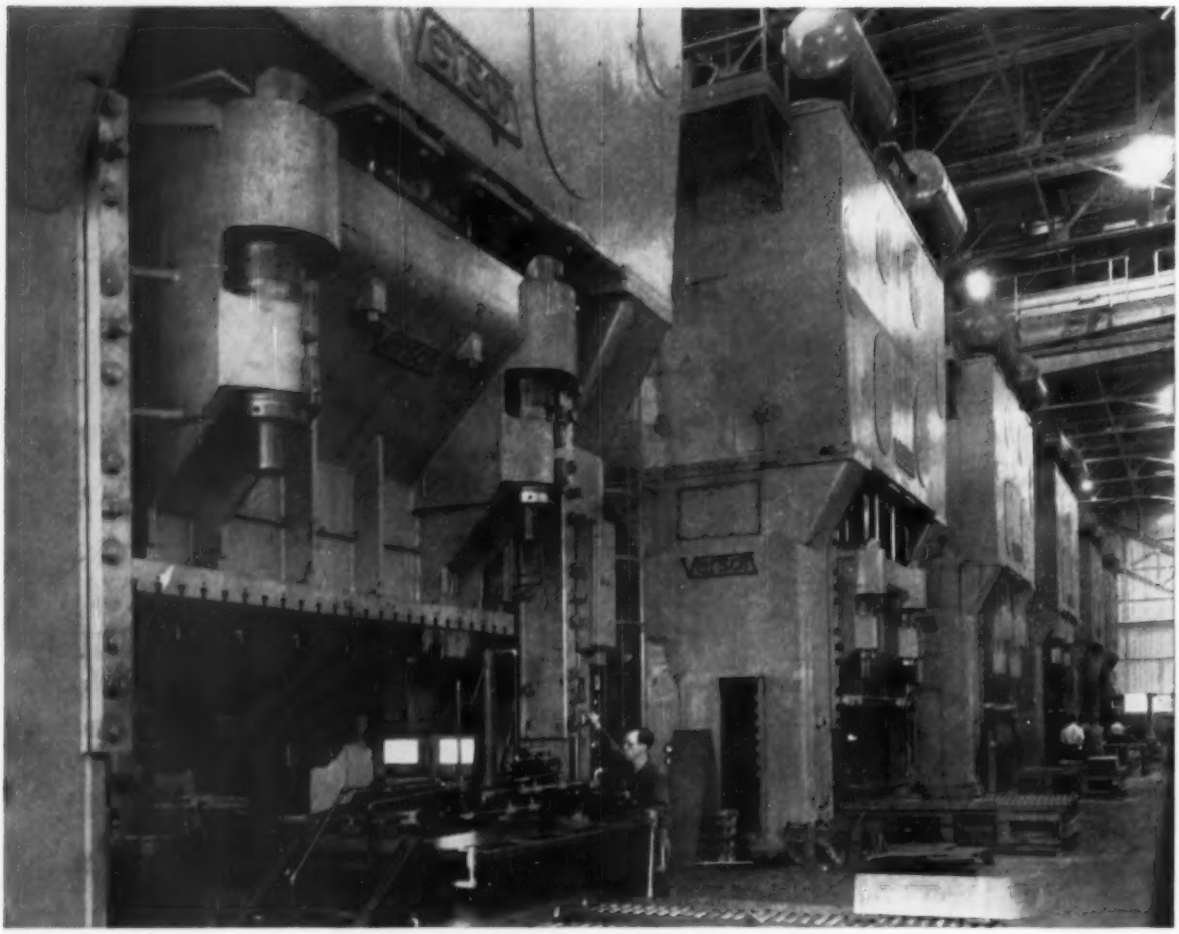


There are many opportunities for substantial savings in this class of work by using combinations of cutters to machine a number of surfaces in one pass.

WRITE FOR Catalog 66K describing Ingersoll Inserted Blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U. S. A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS



Could you compete with a press room like this?

the RISING COST of Obsolescence

Obsolescence is the creeping malignancy of manufacturing. The longer it goes unchecked, the weaker its victim becomes, the more costly the cure. Recent developments by Verson in the press forming of metals have obsoleted processes that were the most efficient available a few short years ago. Check your plant for symptoms.

Unless you're in the automotive industry you probably won't have to compete with this particular press room. But, if you make anything that is pressed out of metal you probably will have to compete with a press room equally modern and efficient.

What does this mean to you?

Competition that reaches its culmination in the market place often begins in the shop. Here is where a large measure of your competitive price position is determined. Here is where profits can be made—or lost.

What's the answer?

The answer is a *planned* program of modernization of your production processes. Sit down with your suppliers and develop a program for systematically replacing inefficient, obsolete methods. Generally, you need not replace it all at once. Very often one machine at a time can be replaced, just so it is done to a well developed plan.

In your press room, sit down with Verson. Put Verson experience in the development of production processes to work for you. Utilize the know-how that results from Verson's approach to press building—"Anyone can build a press, Verson builds production processes". Write or phone.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9316 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

American Machinist REFERENCE BOOK SHEET

LAYOUT OF INVOLUTE TEMPLETS..I

JAMES W DUFFY, gear engineer associated with FORD MOTOR COMPANY, AIRCRAFT ENGINE DIVISION, CHICAGO

For designing and checking of involute gear teeth, engineers and draftsmen must often develop the involute curve for templets or comparator charts.

The layout problem can be simplified by reducing all computations to right-triangle solutions. All calculations are predicated on the relationship between the base angle Θ and the pressure angle ϕ, which is arc Θ = involute ϕ. Basic formulas are shown with sketch, Fig 1.

Example:

Develop an involute curve of ten magnifications (10 X) that will satisfy a 7-tooth spur gear with these characteristics:

- Diametral pitch—6
- Pressure angle—28°
- Pitch dia—1.1667 in.
- Outside dia—1.500 in.
- Dia at lowest point of contact —1.0310 in.
- Base circle dia—1.0301 in.
- Whole depth of tooth—0.3400 in.
- Degrees of angular roll from base-circle dia to L P C dia—2°24′

To draw the involute curve, refer to schematic sketch, Fig. 2, and the actual layout, Fig 3, on page 165. The steps are:

1. From the y-y vertical axis, draw a base line 10 in. long to C.

2. On y-y, space off the distances Θ_1, Θ_2, Θ_3, . . . , equal to 10 times the tangents of these base angles. Select values of Θ from the table on page 167. Start with a value small enough (in this case 1°), so that the first plot point for the involute curve will be well below the lowest point of contact on the tooth. Obviously, the several values of the base angle Θ can be accurately represented by making its adjacent side 10 in. and its opposite side (on the y-y axis) equal to 10 times its tangent.

3. From C, describe arcs equal to the radiuses of the base circle, pitch circle and outside diameter.

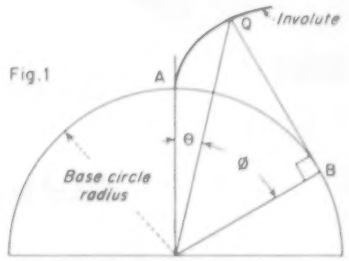
4. Determine the value of Θ_1, the base angle for a pressure angle ϕ_1 of 28°. The calculation is:

$$\text{inv } \phi = \tan \phi - \text{arc } \phi \text{ (radians)}$$
$$= 0.5317094 - 0.4886922$$
$$= 0.0430172 = \text{arc } \Theta$$

From a table of involute functions, Θ_1 is found to be 2°27′53″. Find the tangent of Θ_1 and multiply by 10. Step this distance off on the y-y axis.

5. For a pressure angle of 28° at the pitch diameter, the roll angle from the base circle = $\Theta_1 + \phi_1$ = 2°27′53″ + 28° = 30°27′53″. Therefore, from C draw ϕ_1 adjacent to Θ_1. Now, the length of the plotting line equals the base circle radius times the tangent of ϕ_1 = 5.1505 × 0.5317094 = 2.73857 in. The plotting line is tangent to the base circle radius and forms the side opposite of ϕ_1 = 28 deg.

6. Additional points on the curve are found by taking increments of Θ from the table, page 167, and finding the corresponding value of ϕ, then calculating the length of the corresponding plotting line. For example, with Θ_2 taken as 14°30′, the value of ϕ_2 is 47°3′1″ (from table) and the length of the plotting line becomes 5.53296. Here the point on the involute curve falls just outside the gear OD. To smooth the curve, intermediate values of Θ and ϕ can be plotted.

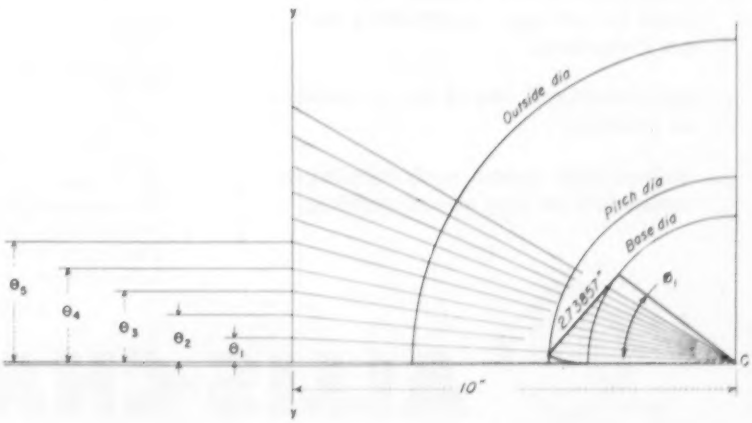


Arc AB = Length BQ = tan ϕ
Arc Θ + arc ϕ = tan ϕ
Arc Θ = tan ϕ − arc ϕ
= involute ϕ

Degrees of Roll to LPC

The degrees of roll from the generation of the involute curve at the base circle to the lowest point of contact is found by the formula:

$$\cos \Theta = \text{Base circle dia} \div \text{LPC dia}$$
$$= 1.0301 \div 1.0310$$
$$= 0.99912706$$
$$\Theta = 2°23'40''$$
$$\tan \Theta = 0.0418153$$
$$\text{Angle of roll} = 57.29577951 \text{ times } \tan \Theta$$
$$= 2.39584°$$
$$= 2°23'45'', \text{ or roughly } 2°\ 24'$$



NEW *Synduction* MOTOR

Do you have an Application Requiring . . .

. . . Constant speed, regardless of load or voltage, depending only on frequency.

. . . Synchronized speed for a number of motors.

. . . Adjustable speed with minimum variation at any speed setting.

Synchronous Speed with Induction Simplicity

Allis-Chalmers new development — the *Synduction* motor — offers these characteristics at low cost — with the dependability of an induction motor. In addition to constant speed from no load to pull-out, it also offers across-the-line starting, wide range of speeds and high efficiency. It's another example of MORE motor pioneering by Allis-Chalmers.

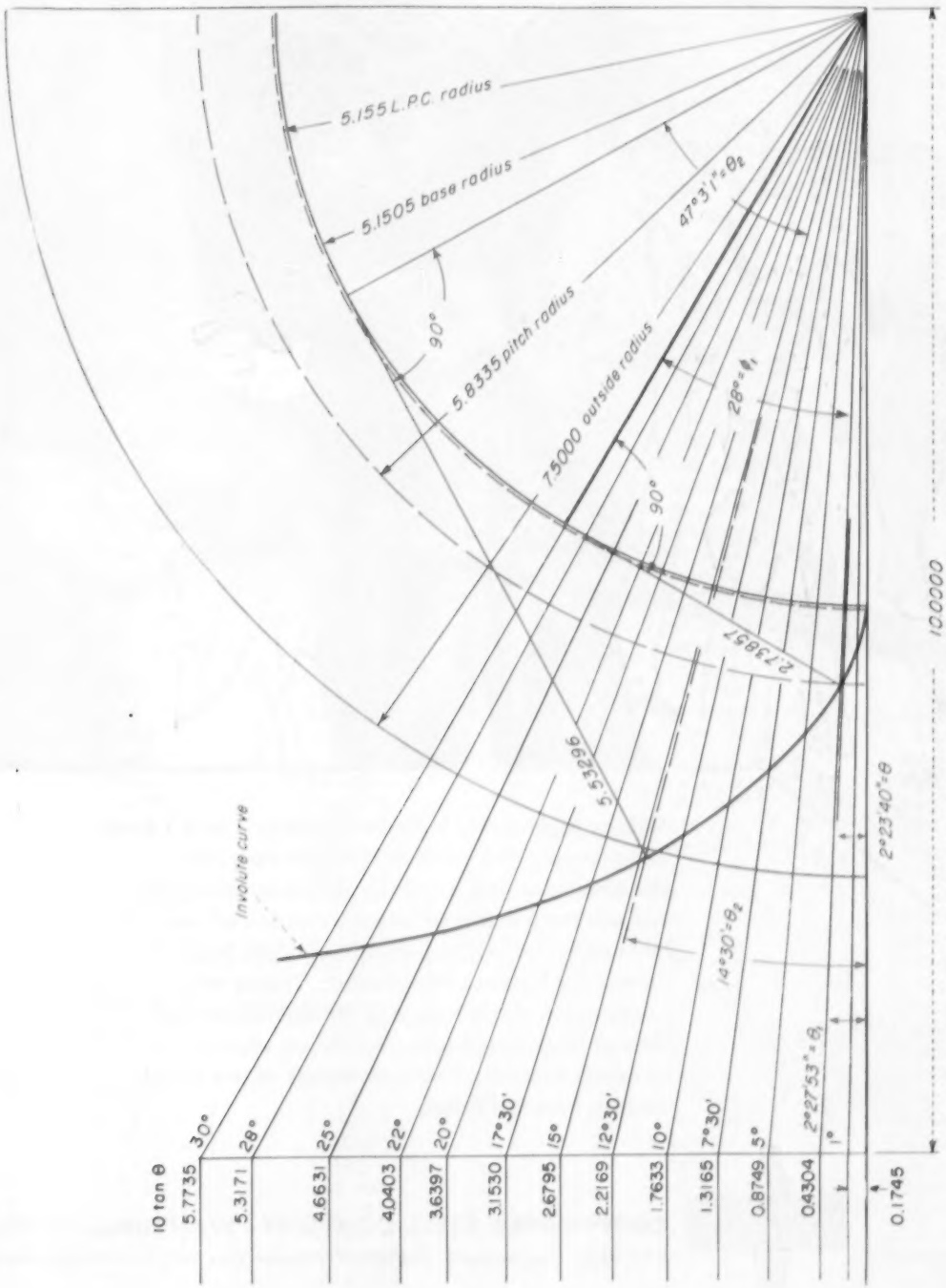
Allis-Chalmers invites your inquiry, in the belief that many processes can be improved by the application of *Synduction* motors. Our engineers will gladly analyze your present operations to help you determine where *Synduction* motors can be applied profitably. Call your A-C office or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin, for Bulletin 51B8440.

Synduction is an Allis-Chalmers trademark.

A-5115

ALLIS-CHALMERS

LAYOUT OF INVOLUTE TEMPLETS.. II



MR. JAMES T. RICCELLI

Poured

Making high quality leaded alloy steels is no tea party. The planning, the constant scientific study, the checking of minute details by skilled metallurgists and workmen that goes into the creation of one billet of leaded steel represent one of the highest forms of industrial craftsmanship. That is why Copperweld, manufacturer of the most diversified lines of lead-treated alloy and carbon steels, is recognized leader in the manufacture of hot-rolled blooms, bars and billets.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY • Steel Division • Warren, Ohio
EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

LAYOUT OF INVOLUTE TEMPLETS.. III

RELATIONSHIP OF BASE AND PRESSURE ANGLES AT POINTS ON INVOLUTE CURVE

BASE ANGLE Θ	PRESSURE ANGLE ϕ	TAN ϕ	BASE ANGLE Θ	PRESSURE ANGLE ϕ	TAN ϕ
0° 6′ 0″	9°54′33″	0.1746928	18°30′ 0″	50° 9′ 8″	1.1982042
0°12′ 0″	12°27′20″	0.2208809	19° 0′ 0″	50°29′47″	1.2129293
0°18′ 0″	14°13′48″	0.2535961	19°30′	50°40′56″	1.2209881
0°19′ 4″	14°30′ 0″	0.2586176	20° 0′	51° 9′36″	1.2419726
0°24′ 0″	15°38′ 6″	0.2798635	21° 0′	51°47′38″	1.2704945
0°30′ 0″	16°48′55″	0.3022088	22° 0′	52°24′ 0″	1.2985265
0°36′ 0″	17°50′31″	0.3218726	23° 0′	52°58′50″	1.3261082
0°42′ 0″	18°45′22″	0.3395733	24° 0′	53°32′16″	1.3532876
0°48′ 0″	19°35′ 0″	0.3557562	25° 0′	54° 4′24″	1.3800930
0°51′14″	20° 0′ 0″	0.3639702	26° 0′	54°35′18″	1.4065301
0°54′ 0″	20°20′28″	0.3707271	27° 0′	55° 5′ 5″	1.4326521
1° 0′ 0″	21° 2′31″	0.3847042	23° 0′	55°33′48″	1.4584601
1°13′58″	22°30′ 0″	0.4142136	29° 0′	56° 1′31″	1.4839728
1°15′ 0″	22°36′ 1″	0.4162655	30° 0′	56°28′18″	1.5092131
1°30′ 0″	23°57′ 3″	0.4442008	31° 0′	56°54′13″	1.5342033
1°43′ 3″	25° 0′ 0″	0.4663077	32° 0′	57°19′18″	1.5589565
1°45′ 0″	25° 8′55″	0.4694693	33° 0′	57°43′36″	1.5834748
2° 0′ 0″	26°13′44″	0.4926875	34° 0′	58° 7′10″	1.6077831
2°15′ 0″	27°12′54″	0.5142613	35° 0′	58°30′ 2″	1.6318872
2°27′53″	28° 0′ 0″	0.5317094	36° 0′	58°52′15″	1.6558126
2°30′ 0″	28° 7′27″	0.5344922	37° 0′	59°13′49″	1.6795329
2°45′ 0″	28°58′ 8″	0.5535995	38° 0′	59°34′48″	1.7031153
3° 0′ 0″	29°45′30″	0.5717401	39° 0′	59°55′12″	1.7264792
3° 5′23″	30° 0′ 0″	0.5773503	40° 0′	60°15′ 4″	1.7497158
3°30′ 0″	31°12′ 4″	0.6056480	41° 0′	60°34′24″	1.7727843
4° 0′ 0″	32°29′47″	0.6369817	42° 0′	60°52′39″	1.7949862
4°30′ 0″	33°40′27″	0.6662659	43° 0′	61°11′37″	1.8185129
5° 0′ 0″	34°45′19″	0.6938612	44° 0′	61°29′33″	1.8411960
5°30′ 0″	35°45′20″	0.7200442	45° 0′	61°47′50″	1.8647750
6° 0′ 0″	36°41′15″	0.7450377	46° 0′	62° 4′ 6″	1.8861498
6°30′0″	37°30′22″	0.7674965	47° 0′	62°20′46″	1.9084496
7° 0′ 0″	38°22′51″	0.7920458	48° 0′	62°37′ 3″	1.9306387
7°30′ 0″	39° 9′21″	0.8142973	49° 0′	62°52′58″	1.9527237
8° 0′ 0″	39°53′26″	0.8358497	50° 0′	63° 8′32″	1.9747129
8°30′ 0″	40°35′19″	0.8567588	51° 0′	63°23′45″	1.9965912
9° 0′ 0″	41°15′14″	0.8770966	52° 0′	63°38′38″	2.0183675
9°30′ 0″	41°53′22″	0.8969162	53° 0′	63°53′48″	2.0409534
10° 0′ 0″	42°29′52″	0.9162600	54° 0′	64° 7′28″	2.0616568
10°30′ 0″	43° 4′52″	0.9351653	55° 0′	64°21′26″	2.0831682
11° 0′ 0″	43°38′31″	0.9536841	56° 0′	64°35′ 8″	2.1046256
11°30′ 0″	44°10′53″	0.9718258	57° 0′	64°48′32″	2.1259642
12° 0′ 0″	44°42′ 4″	0.9896209	58° 0′	65° 1′41″	2.1472514
12°30′ 0″	45°12′10″	1.0071034	59° 0′	65°14′34″	2.1684487
13° 0′ 0″	45°41′15″	1.0242909	60° 0′	65°27′12″	2.1895719
13°30′ 0″	46° 9′22″	1.0411927	61° 0′	65°39′36″	2.2106383
14° 0′ 0″	46°36′37″	1.0578504	62° 0′	65°51′45″	2.2316083
14°30′ 0″	47° 3′ 1″	1.0742571	63° 0′	66° 3′42″	2.2525584
15° 0′ 0″	47°28′37″	1.0904273	64° 0′	66°15′25″	2.2734203
15°30′ 0″	47°53′29″	1.1063876	65° 0′	66°26′55″	2.2942133
16° 0′ 0″	48°17′39″	1.1221453	66° 0′	66°38′13″	2.3149579
16°30′ 0″	48°41′ 9″	1.1377087	67° 0′	66°49′19″	2.3356450
17° 0′ 0″	49° 4′ 1″	1.1530867	68° 0′	67° 0′13″	2.3562653
17°30′ 0″	49°26′17″	1.1682896	69° 0′	67°10′55″	2.3768091
18° 0′ 0″	49°47′59″	1.1833286	70° 0′	67°21′27″	2.3973320

3 kinds of help on sheet and strip steel

Sheet and strip buyers tell us that three kinds of purchasing help keep them coming back to Ryerson:

1. WIDER SELECTION OF TYPES—More than 20 kinds of sheet and coil stock are on hand in an unusually wide range of gauges—making it easier to get the exact steel needed for any requirement.

2. GREATER PROCESSING CAPACITY—The most extensive cutting and processing facilities in the steel-service industry enable buyers to get quickest service on requirements for special sizes, strip and sketch cutting, blanks, slit coils, edging, or any other processing.

3. HELP ON SHEET AND STRIP PROBLEMS—The large Ryerson staff of sheet and strip specialists gives buyers a valuable source of help in selecting the most satisfactory and economical stock—or in solving any other problem of application and fabrication.

In addition, sheet and strip buyers like the good packaging, the dependable weight and on-schedule delivery that they get from Ryerson—and the convenience of one-order buying of all steel products from the same source. So call your nearby Ryerson plant for 3-way help on sheet and strip needs.

RYERSON STEEL

PRINCIPAL PRODUCTS: Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing, industrial plastics, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Talking Shop . . .

Talent Search

"WHAT WOULD YOU rather be?" This is the question Orr & Sembower, Inc, asked its employees in a recent survey. Fred Klein, president of the Reading (Pa) company explains the aim as a search for people that can be trained for posts of higher responsibility. "People are happy and do their best work when they have a job tailored to their abilities," he says. Those who would rather be in a different type of work will be given aptitude tests. About 60 employees were expected to respond, but so far nearly twice that many have applied.

Ceramic Rests

ONE OF THE large plants in Cleveland that has been testing ceramic tools for turning operations also had a problem in cylindrical grinding. The hardwood inserts in the ends of work-support rests wore rapidly. Because of the high resistance of ceramic toolbits to abrasive wear, they were tried as replacements for the hardwood inserts. Held in place by an epoxy-resin cement, the ceramic inserts are working fine.

Titanium Spinning

AFTERBURNER SHROUDS for turbojets are flame spun at Spinco, Inc, Indianapolis. The AT-110A titanium cylinder is 17¾-in. OD with 0.061 in. sections. The cylinder is mounted in a spinning machine and shaved to size. Then the work is heated with an Oxweld blowpipe while it is revolving and spun to shape with Ampro-Bronze spinning wheels. One end of the cylinder is shaped to form a 2-in. lapover.

High-nickel Welds

ATOMIC ENERGY REQUIREMENTS for pumps gave the Elano Corp some problems until they developed a technique for welding sections to 2 in. in high-nickel alloys that would cope with the temperature, pressure, and corrosive fluids common in nuclear applications. The resulting "cold-weld" technique requires multiple passes with 3/32-in. rod to hold the heat input down. About 40 passes are required to weld a 2-in. section. Contrary to accepted practice a straight bead is laid down (always working in the downhand position) with a dipping action. Parts are degreased before welding and any metal that must be removed before or during welding is machined out with a rotary file or bur. Chips are removed with a stainless wire brush. All operators wear gloves because even a fingerprint can be fatal to properties. Argon-gas shielding is used with a dc welder operating at 60 amps. Speed is about 1 in. per min. Each pass is checked with a dye penetrant and voids are cut back (never ground) until sound metal is reached. The resulting weld, after annealing in a helium atmosphere, has properties like cold-drawn nickel alloy rod.

Ten Millionths

ROUTINE COMPARISONS of length to the nearest 0.000,000,1 in. are made on an interferometric comparator developed by T R Young and J B Saunders at the National Bureau of Standards. The instrument will be used to check the length of master gage blocks. For some years the gage blocks have been checked to the nearest millionth, however, this is no longer considered adequate and a crash program has been under way for the past three years to cut the calibration to one part in ten million. The major problem remaining is the exact calibration of the primary standard with which the master gage blocks will be compared.

Two gage blocks to be compared are wrung to the horizontal surface of a flat plate. A double prism transmits two beams of collimated white light down onto the top surfaces of the gage blocks and the flat plate. After reflection, the beams combine at the dividing surface of the double prism, and two separate patterns of interference fringes are formed in the eyepiece of a telescope. If the blocks are of equal length, the two fringe patterns will coincide, but if there is a difference in length, the fringe patterns wll be proportionately displaced. The observer then uses a micrometer screw to move an optical wedge system until the two patterns coincide with the cross hair in the microscope eyepiece. This distance is read from the micrometer and converted into the corresponding difference in gage-block length.

Is this your chance for a better job?

***American Machinist* is expanding its New York editorial staff and has an opening that will offer the right man a real opportunity. The man we seek should be an engineer (probably mechanical, industrial, or production) with several years experience in metalworking plants. He may have had little or no professional writing experience, except reports, but will enjoy putting his thoughts on paper and will express himself well. He will like meeting people and will welcome the opportunity to broaden his technical horizons by following the fast-breaking developments in the metalworking industries. The right man will find this an exciting and rewarding job.**

If you think you are this man, write now, including all pertinent facts, to Burnham Finney, Editor.

NEWS REPORT

AFL-CIO's First Birthday Marks

WASHINGTON — Labor's giant AFL-CIO reached its first birthday this week with its sights still set on the horizon. The goals laid out at the forming of the federation last December are just about as many steps away as they were then.

Like a smouldering volcano, the 15-million-member labor federation has a potential force that will remain untested until it erupts. And there's no indication that the outburst is coming; a calm that settled over the AFL-CIO soon after its formation seems likely to stay around for the foreseeable future.

But the alliance of some 140 unions is making plans in case this is just a calm before the storm. Mainly, the quiet shift of two big organizations—AFL and the CIO—into one is a reflection of the moderate atmosphere of the nation and the high level prosperity that has gone with it. As long as this continues, the federation won't be taking any major strides.

Should this not be the case, however, the federation has some strategy in the works, particularly in the important area of collective bargaining—and especially among the industrial unions. Probably the most important innovation growing out of the AFL-CIO is its Industrial Union Department. The 72 industrial unions represented in this department are now drawing up bargaining strategy that could mean alterations in industrial negotiations.

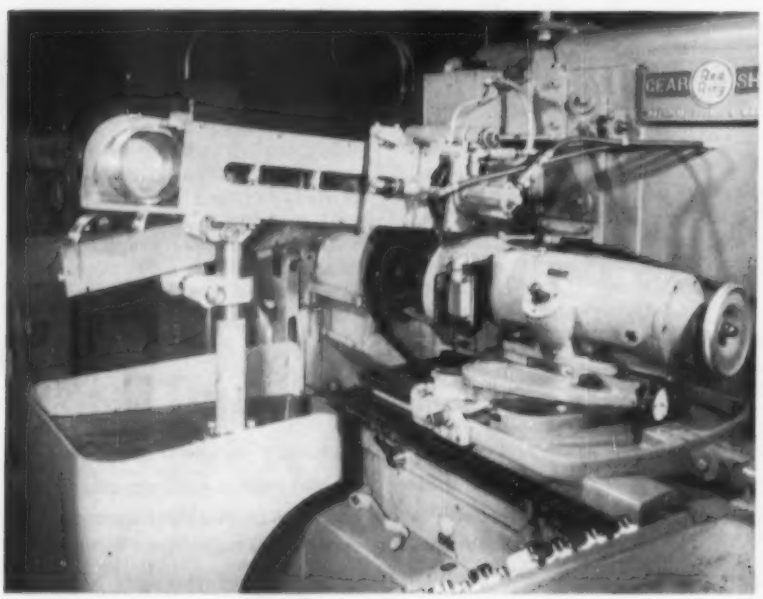
Unions in such distinct bargaining areas as Metalworking are making plans to coordinate negotiating goals like the guaranteed annual wage, health and welfare plans, automation safeguards and so on. Already, they are discussing problems of bargaining with mutual companies, and in single areas where they eventually may pit their combined force againt employers.

As in other AFL-CIO programs, this bargaining alliance is still in the talking and planning stage. It will develop slowly, and probably won't mean much until a change in the atmosphere, such as a recession, would put the member unions in the same camp as a matter of mutual interest.

This is true, too, of AFL-CIO's other projected goals. Here's a rundown of what has developed in the first year, and what prospects are for the future:

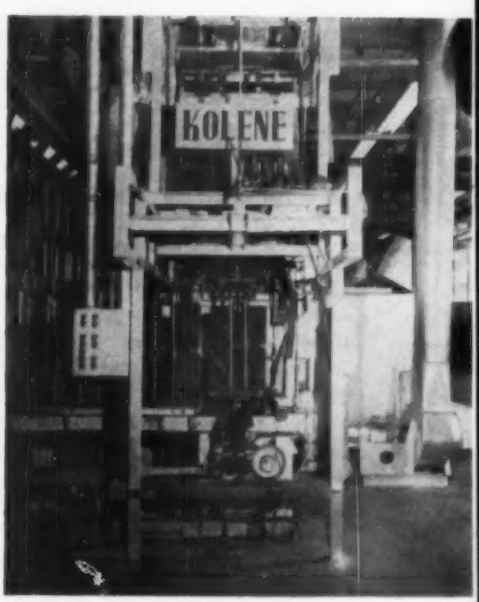
Organizing — a mass organizing

Chrysler Dedicates Its Torque-Flight



Automatic loading and unloading . . .

speeds production of annulus gears in this Red Ring shaver at Chrysler's new Kokomo, Ind, transmission plant (see *AM*—Nov 5/56 pp 153-160 for detailed story). Magazine is loaded manually but operation thereafter is automatic. Gears are gravity fed from the inclined magazine to an air-operated plunger that pushes them, one at a time, into a loading sleeve. A finished gear is removed from the other end of the sleeve into an unloading magazine as each rough gear is loaded. Loading sleeve then positions an unshaved gear in line with the work head, and swings out of the way while the gear is chucked. After shaving, gear is removed, a new one loaded, and cycle is repeated



Annealing and cleaning . . .

of CI transmission cases is automatic. After 3 hrs annealing at 1100 to 1550 F castings are automatically transferred to this 45-ft-long Kolene cleaning line. Carriers handle four cases each, move them through both annealing furnace and cleaning line in balance. Gross production rate of cases is 220 per hour

NEWS REPORT

Year of Few Accomplishments

drive was heralded as the No. 1 goal of AFL-CIO—a sweep through the non-union South and a breakthrough on the white collar front. Results to date—virtually nil. This isn't entirely the fault of the federation's organizing strategists. It's a combination of several factors; one of them is the effect of AFL-CIO's "moderation" atmosphere, which takes a toll of organizing energies, and of the willingness of non-union workers to join labor unions.

After months of negotiations, former AFL and CIO unions that used to work the same territory are now unable to decide on which union is to organize which plant.

The South was to have been the target area for the AFL-CIO's first organizing project. However, the dispute over the Civil Rights issue, stemming from the Supreme Court's decision, has reached into the union hall, where some unionists are active segregationists while others, particularly AFL-CIO leaders, are promoting integration.

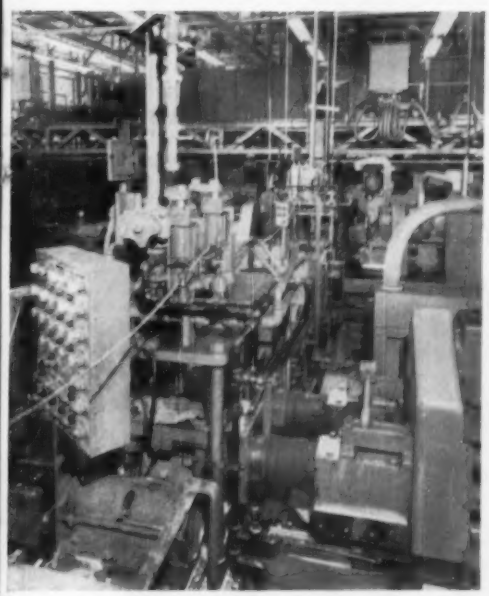
• **Politics**—last month's election confirmed the fears of some AFL-CIO political experts—that labor really doesn't do a very effective job at the polls. Despite public statements to the contrary, political officials were disappointed with results, except in some isolated instances. The federation's political arm, the Committee on Political Education, was in the Democratic camp on virtually all candidates and scored an unimpressive batting average. But for the future, plans are already being drawn up to intensify political campaigning for the 1958 elections.

As for legislation in the coming Congress, the AFL-CIO will be promoting much the same goals as in the last Congress, with the outcome appearing to be much the same. Primarily, AFL-CIO will seek: some substantive changes in the Taft-Hartley Act (which can already be written off as unacceptable to the new Congress); an increase in the Minimum Wages to $1.25; federal funds for chronically-depressed areas; and some acceptable controls over union health and welfare funds.

• **Jurisdictional troubles** — the recurring fight between the AFL-CIO's two biggest departments — the Industrial Union Department and the Building Trades Depart-

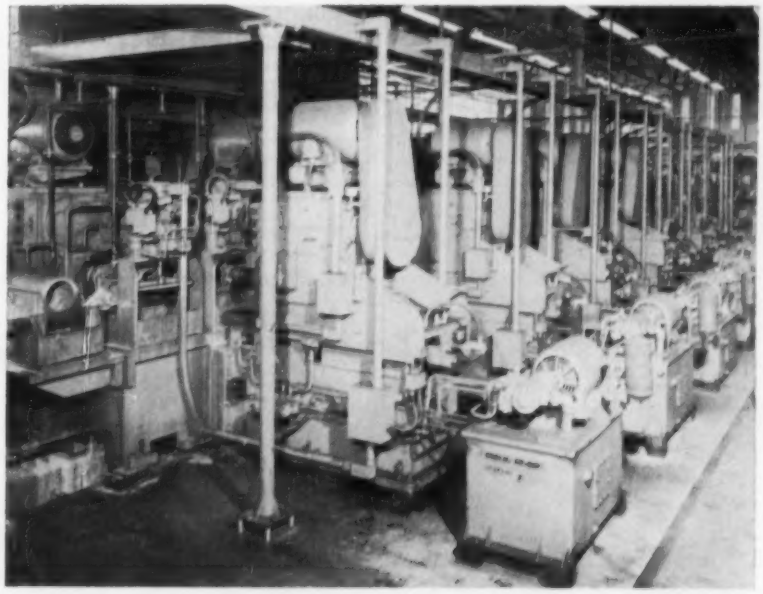
(Continued on next page)

Transmission Plant at Kokomo



Balanced case output . . .

is accomplished with an Ex-Cell-O shuttle mechanism with two overhead carriers that serve 5 machines. Each carrier picks up four cases from a transfer machine on the two parallel lines, transfers them to the five boring and facing machines, removes finished cases, replaces them with new ones



Machining transmission cases . . .

at Chrysler's Kokomo plant requires 276 working stations employed in 36 transfer machines. The Fitchburg machines shown in this photograph are part of two parallel 600-ft lines. Electrically interlocked machines on these lines were supplied by eight machine tool builders. They are integrated with mechanical handling devices throughout the operation. Final operation is testing transmissions under actual driving conditions, with overhead conveyors delivering assembled transmissions to special Merz units—and automatically carrying them away after the tests have been completed

NEWS REPORT

Deep-Freeze Treatment May Lead to Tailor-Made Alloys

DEARBORN, MICH—Ford Motor Co thinks it may come up with the first "tailor-made" alloys as a result of taking metals down to –459 F. At that temperature metals often do strange things, Ford scientists say: ordinarily non-magnetic metals become magnets; lead and aluminum become superconductors of electricity; an electrical current starting in a loop of lead wire would last forever at –459 F. Ford hopes to attain temperatures within 1/10th of one degree of absolute zero—coldest ever attained by man—in its search for new alloy properties.

AFL-CIO (continued)

ment—continues to rumble throughout AFL-CIO headquarters in downtown Washington, DC. After a series of huddles, conferences, good-will approaches and the like, the two sides are still unable to come to terms.

Several attempts have been made at a solution, but the parties are still warring at scores of projects over job rights to factory construction. Basically, the line seems to be drawn at having the industrial workers already organized in the plant do maintenance construction work. New building would go to the construction unions.

Otherwise, jurisdictional issues diminished even further under the AFL-CIO banner in the year following the "no-raiding" truce, which had been reached between the then-separate AFL and CIO.

• **Other mergers** — the hoped-for alliances of individual unions and the separate state and city AFL and CIO bodies failed to happen during the first year of the merger. No major unions in the same territory have combined.

The same is virtually true within states. Only 17 state AFL and CIO groups have combined, and these are all in states with small union membership, totalling at this point 375,000. However, all state groups are required to join by December, 1957, under threat of losing their AFL-CIO charters.

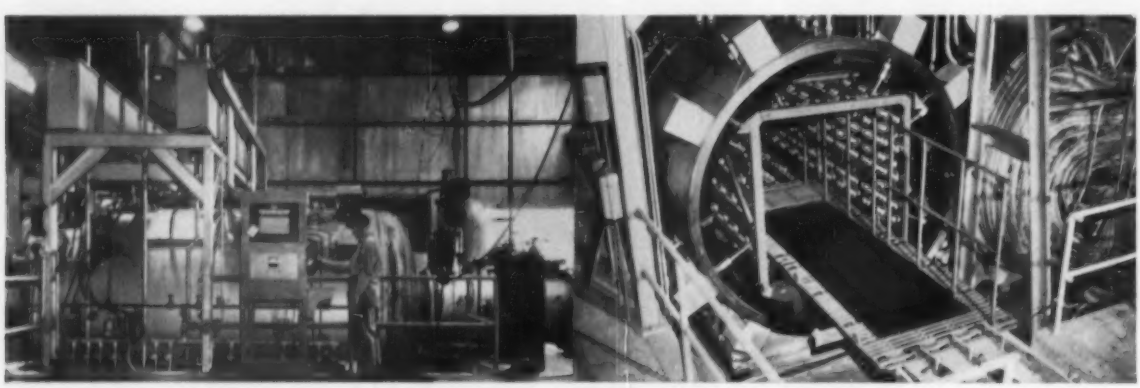
• **Corruption** — the AFL-CIO merged a year ago with a pledge to rout out racketeering elements in organized labor. Probably its anti-corruption campaign is the biggest gain in the federation's short life.

To date, AFL-CIO officials have put three unions on trial before an Ethical Practices Committee armed with material garnered from Congressional investigations into welfare fund fraud. No decisions were reached at the time; the committee is due to make its recommendations early next year, either to clear the charged unions or expel them.

• **Personalities-policies**—The AFL-CIO, on its first anniversary, is beginning to reflect more and more the personality of president George Meany. The ex-plumber, who moved from chief of the AFL to the same job in the combined federation, started out as a conciliator between rival forces at the start of the merger but in the past few months has begun to assert his own opinions.

UAW's Walter Reuther, a strong man of labor, has remained in the background during the federation's first year, evidently preferring not to disrupt the course in its early stages. More can be expected from Reuther this year and in ensuing years.

At the outset of Year No. 2 AFL-CIO is still making plans for a period when the industrial calm is disturbed and it can put into effect its still-developing battle plans for organizing, politics, legislative goals and the like. At this point, however, immediate effects of the AFL-CIO merger after a year are small.



Biggest U S Vacuum Furnace Will Process Titanium

HEAT-TREATMENT AND QUALITY IMPROVEMENT of titanium sheet are the purposes of this new-design vacuum-annealing furnace, largest of its kind, installed at Mallory-Sharon Titanium Corp, Niles, Ohio. Built by Westinghouse, the furnace has a charge space of 4 x 4 x 12 ft, can process several tons of titanium sheet at a time, with the sheet either loaded flat or suspended vertically. In addition to heat-treating titanium sheet to 1600 F, the unit reduces the hydrogen content

FIELD REPORT

East...

Cone to Make And Market Pilot Lathes

WINDSOR, Vt—The Cone Automatic Machine Co Inc has taken over the manufacturing and sales rights of the Pilot automatic copying lathe for the United States and Canada, under a licensing agreement with H Ernault Batignolles, French machine tool builder, according to an announcement by Henry P Chaplin, Cone's president and treasurer. The machine will be known as the Conomatic Pilot and will be sold through Cone Automatic Machine Co's sales organization.

As a result of this agreement, which provides for technical cooperation between the Cone company and the Batignolles company, Cone will assume the service obligations to customers of the H E B Co, Lansing, Mich, which has been marketing the Pilot lathe, redesigned for and adapted to the needs of American users, for the past few years. A number of Pilot lathes, built for H E B by the Industrial Metals Corp of Lansing, have been installed in U S automobile plants and in other user industries. Cone has arranged for transfer to its ranks of the technical personnel of H E B Co.

Eastern briefs . . .

US Signal Corps figures it has saved a quarter of a million dollars by investing $900 in an automatic defect-finding machine built by **Lewyt Manufacturing Corp,** Long Island City. Called the "milking machine" because of profusion of electric cables that reach down from its belly, the machine is used for testing intricate transmitters and receivers, and can be adapted to save testing time on other electronic items . . . **Philco Corp,** Philadelphia, has been awarded a $2-million AF contract; details as to nature of the work were lacking at time of announcement . . . Biggest industrial plant exhaust system in this part of the country is being installed in the facility which **Wyman-Gordon** operates in North Grafton, Mass, for the Air Force. Four air cleaning tanks, 42 ft tall, 10½ ft in diameter, weighing 9½ tons each, will clear vicinity of the 50,000 and 35,000-ton hydraulic, closed die forge presses which W-G put into production in 1955 . . . **Norton Co,** Worcester, Mass, reports that controlling interest in Abrasivos Irmaos Meyer, SA, Sao Paulo, Brazil, has been acquired by **Norton Behr-Manning Overseas, Inc,** a subsidiary. This is Norton's second plant in South America . . . Production workers at **Westinghouse Electric Corp's** Appliance Division at Columbus, Ohio, firmly turned down a bid by an independent union to toss out the AFL-CIO International Union of Electrical Workers; 2208 voted for the IUE, 611 for the IWWA, 52 didn't want any union at all . . . **Waterbury Farrel Foundry & Machine Co,** Waterbury, Conn, has acquired the **Sendzimir Cold Rolling Mill** interests of the **Armzen Co.** It'll be incorporated into WF's operating structure as the Sendzimir Mill Division . . . A **Metal Physics Section** has been set up at the **National Bureau of Standards.** Specific areas in which research will be conducted include diffusion in metals, electric and magnetic properties, interstitial compounds, and solid state transformations . . . **Worcester Pressed Steel Co,** Worcester, Mass, is giving up its 47-year-old steel rolling activities to make way for increased stamping business. All equipment has been sold to the **Rome Strip Steel Co,** Rome, NY . . . **Vertol Aircraft Corp,** Morton, Penna, largest US independent helicopter manufacturer, has completed arrangement for foreign sales representation in Peru, Vene-

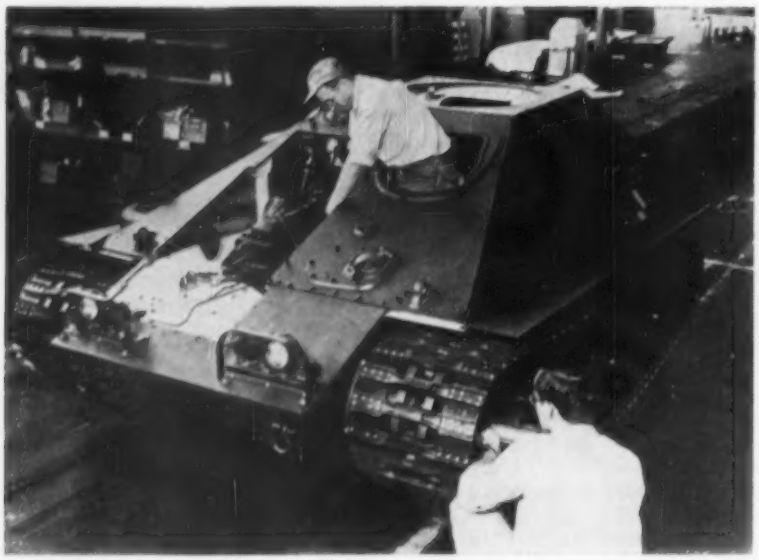
Are Superalloys Tough to Machine?

THIS SHAVING from a heat-treated titanium alloy (6A1, 4V) was cut at 260 sfpm in a planer with a negative-rake flat tool of Rex AA. This alloy reportedly can't be cut at over 100 sfpm—but nobody remembered to tell the apprentice who did the job at Boeing. What's more, he got excellent tool life, and the chip isn't discolored

Hot off the stretch-forming press...

BURBANK, CALIF: Removing an emergency exit door frame for an Electra jet transport from Lockheed Burbank's new $350,000 stretch-forming press, where it has been contoured to match design drawings

FIELD REPORT



First production model of "Ontos"
LAPORTE, IND: Workmen put finishing touches on the first production model of the Army's new anti-tank weapon, "Ontos" (meaning "The Thing" in Greek), at Allis-Chalmers Mfg Co's plant. Ontos is powered by a 145-hp engine, carries six 106-mm recoilless rifles on its turret

GE's Turbine Park . . .
SCHENECTADY, N Y: Centerpiece of GE's new "Turbine Park," shown being dedicated, is an old (1903) 5000-kw steam turbine generator unit, once in service at Chicago's Fisk Station

zuela, Japan, and "nearly every Western European nation." Company has already sold 100 of its 20-passenger H-21 copters to the French military services . . . **GE's** Large Steam Turbine-Generator Dept has begun construction of a $2,500,000 "Overspeed Test Facility" scheduled for mid-'57 operation. Building will cover 8700 sq ft of space, will be used to spin steam turbine rotors and generator rotors weighing up to 185 tons at 170 to 200% above normal speed of rotation to evaluate effects of abnormally severe operating conditions on material properties and design features.

Midwest...

Midwest newsbriefs . . .
Stockholders of **J I Case Co** and **American Tractor Corp** voted a thumping yea of approval to merger plans . . . **King-Seeley Corp** has begun work on a 50,000-ft expansion of its 275,000-sq-ft plant in Scio, Mich. Additional space, to cost a half-million, will be used to house " a new automotive product," and to expand another product for a new auto model scheduled for introduction next year . . . **Bucyrus-Erie Co** of South Milwaukee will build its new $12-million plant on a 148-acre tract at Richmond, Ind. Facility, employing 1000, will manufacture oil well drilling machines . . . Army Ordnance contracts in the neighborhood of $3 million have been awarded to **Ford Motor, Chevrolet Division of General Motors,** and **American Motors** for production of sedans and station wagons . . . Buick number 9 million came off the assembly line at Flint 19 months after the line had turned out vehicle number 8 million. Period was faster by three months than previous records . . . **Ford Motor Co's** total US employment will pass the 200,000 mark sometime before year's end, highest in Ford history (despite automation) . . . **Chrysler** says that automatic transmissions are now being installed on more than 85% of its cars; 99.9% of the Chrysler Division cars have them—optional on Windsor model only—DeSoto is putting automatics on 99% of its output; demand for TorqueFlite or PowerFlite on 1957 Plymouths is running at about 75.4%, and Dodge is installing them on 94.7% of all models . . . **Nordberg Manufacturing Co,** Milwaukee, has sold its gasoline marine engine business to **Universal Motor Co** of Oshkosh . . . **Divco Corp,** delivery truck maker, is now identified as **Divco Truck Division** of **Divco-Wayne Corp.** New name is result of Divco's purchase of **Wayne Works** of Richmond, Ind, and its subsidiaries, makers of school bus bodies, ambulances, and funeral cars . . . According to export reports, German auto producers in October broke the 100,000 mark for the first time by turning out 101,428 vehicles. Exports accounted for 47.2% of the record October volume . . . **Pettibone Mulliken Corp** has acquired the **Mercury Manufacturing Co** of Chicago through an exchange of stock. Mercury makes tow tractors, electric lift trucks, and trailers.

West...

Around the West . . .
Lockheed Aircraft has received a $70-million contract for T2V-1 SeaStar jet training planes. Order, largest of its kind ever placed by the Navy, will extend production of the ship-or-shore-duty trainers through 1958 . . . **Titan Metal Manufacturing Co** will start construction early in 1957 of its $2.5-million brass mill in Newark, Calif. It'll be in operation by year's end, turning out rods and forgings . . . **Sierra Electronic Corp,** San Carlos, Calif, has been pur-

FIELD REPORT

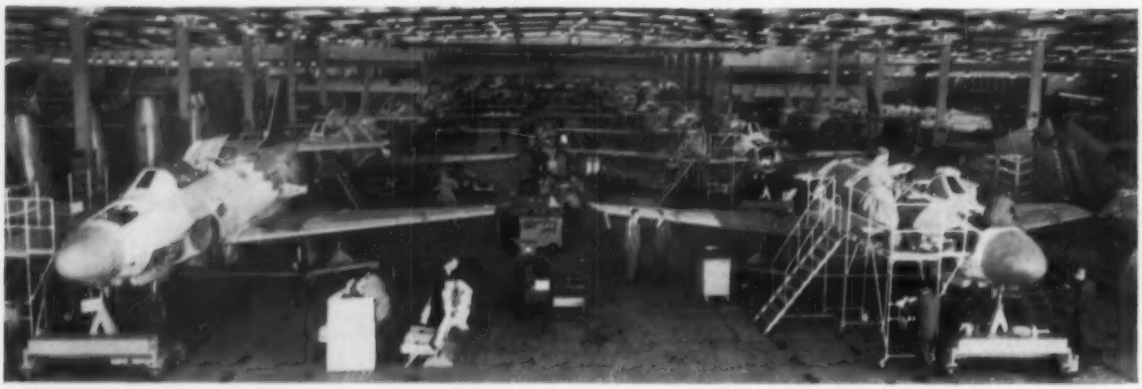
Recruiting wrinkle . . .
SEATTLE: This is Boeing's "career wagon," a traveling employee recruiting office that travels rural areas in search of machinists, welders, tool makers and potential trainees

NTDMA Gets Safety Council Award . . .
CHICAGO: At the recent National Safety Congress here, the National Tool and Die Manufacturers' Association received this plaque for promoting safety in small business. NTDMA president Herbert Harig of Chicago is shown receiving the award from David L Arm, left, manager of NSC's Industrial Department

chased by **Philco Corp,** will be operated as a subsidiary under Philco's government and industrial division. Company, which makes electronic test equipment, UHF transmitters, radio navigation equipment, will move in February to a new plant in Menlo Park . . . 300 scientists and engineers will be updated on latest information on the role of solar furnaces in the study of materials at ultra-high temperatures at the **Solar Furnace Symposium** to be held Jan 21-22 at Phoenix's Hotel Westward Ho. Co-sponsors with the Association for Applied Solar Energy are Stanford Research Institute, Arizona State College, and the University of Arizona . . . If **Boeing** exercises its option on the vacant **Ford Motor** assembly plant at Richmond, Calif, it'll assemble Bomarc supersonic guided missiles there. Wichita (Kansas) Div was to have done the work, but will now be tied up exclusively on stepped-up construction of B-52 jet bombers. The 60-acre Ford facility was left tenantless when assembly operations were switched to the new plant at Milpitas, Calif . . . New assembly-line method of pouring 50-lb aluminum pigs is being installed at the Mead reduction plant of **Kaiser Aluminum & Chemical Corp;** mechanical casting system will be finished by month's end at a cost of $134,000. New equipment will take aluminum from the potrooms at rate of 20,000 lb per hr, each pig automatically stamped and coded by alloy content . . . **Moore Development Co** has been formed in Torrance, Calif, to specialize in experimental and prototype fabrication of aircraft components . . . **Lockheed Aircraft's** missile systems division will add another 96,000 sq ft to facilities under construction at Sunnyvale and Palo Alto. Company's investment at the two locations has already hit $19 million, will be up to $30 million by end of '57 . . . AFL-CIO International Association of Machinists District 50 has asked for an unscheduled 4¢-an-hour wage increase for 27,000 workers at **Convair, Solar,** and **Rohr.**

South . . .

Dixieland notes . . .
FLORIDA: Chicago's **Cook Research Laboratories,** electronic research and development outfit, will open a Florida district office for closer coordination with aircraft firms and defense contractors in the state . . . **Atlantic Steel Co** has just dedicated its $2.5-million merchant bar and rod mill. Designed to be one of the fastest of its type in the world, the new mill turns out rod at 5000 sfpm, merchant products at a rate of 60 to 90 tons per minute. The mill produces rods, rounds, flats, angles, channels, light sections . . . **Atlas Ornamental Iron Works** and **Colonial Forge,** both of Atlanta, have merged as **Atlas Ornamental Iron Works Inc,** with products bearing the trade name **"Colonial Forge"** . . . **TENNESSEE: Magic Chef Inc,** St Louis, Mo, will expand its **Dortch Stove Co** plant at Franklin, doubling production capacity. The firm's St Louis manufacturing operations will be discontinued, as will foundry operations at Franklin . . . **Air Worthiness Inc,** a new Memphis firm, plans to lease space at the Memphis Municipal Airport for production-line overhaul of military aircraft engines . . . **Synchromatic Corp** of Watertown, Wis, will build a warm-air heating and air-conditioning plant at Nashville . . . **Security Signals Inc, Cordova,** is going into zinc and aluminum die-casting contract work . . . **General Machine Works** of Memphis has developed a machine that forms aluminum awning molding . . . **Ford Motor Co's** current investment in Nashville is reported to be in the neighborhood of $60 million . . . **Tucker Steel Corp,** Knoxville, is building a $500,000-plus warehouse and plant.



SAAB-32 jet 2-seater, all-weather attack fighters are produced in this new modern plant of Svenska Aeroplan A-B

A Swede Looks at U S Metalworking

NEW YORK — Although foundries in the United States are dirty in comparison with those in Sweden, most metalworking plants are surprisingly clean. This was the first impression reported by a Swedish industrialist after a two-month tour of plants in the US and Canada.

Sven G Lind, president, Wedaverken, the light metal works of AB Bofors in Sodertalje, Sweden, has been here visiting aircraft and magnesium plants and machine-tool builders. Summarizing his impressions in an exclusive interview with *American Machinist*, he said:

- From a metallurgical viewpoint the Swedish Metalworking industry can learn little from the United States.
- Much can be learned, however, about the handling of work. He was impressed by how progressive the plants were in this respect.
- He found Americans very hospitable and open-minded with only a few exceptions.
- Most Americans have heard of Bofors (because of its gun) Mr Lind found but he was amazed at the ignorance about Swedish industrial production. Few people realize there is a flourishing metalworking industry—and one cab driver thought Denmark was the capital of Sweden.
- Most of the machine tools used in Swedish metalworking plants are made in America, Mr Lind indicated.

Wing-assembly line at Svenska Aeroplan A-B. In addition to this model, company builds SAAB-35, a delta-wing supersonic jet fighter with a single seat

Magnesium Castings

Wedaverken makes all the magnesium castings for the jet engines built by Svenska Flygmotor A-B at Trollhattan. Flygmotor builds the Rolls-Royce Avon engine with a Swedish reheat system. This company now employs 2000 and has just embarked on a Kr 20 million ($4 million) expansion program.

Mr Lind's company supplies about 75% of the magnesium castings for the SAAB-32 Dragon an all-weather attack plane built by Svenska Aeroplan A-B in Linkoping. This plane is now in line production (see pictures). Only jet fighters are being built in Sweden now—all passenger planes have been licensed to be made in Holland.

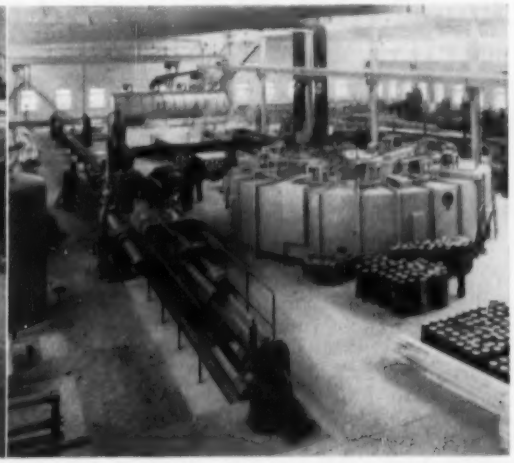
Wedaverken was started in 1920 as Aktiebolaget W Dan Bergman, and when Mr Lind took over firm in 1939 there were 50 workers. It now has an average of 600. Non-military business in both aluminum and magnesium has been growing in recent years and now includes parts for chain saws, pneumatic hammers and pumps.

Most of the magnesium in commercial grades for Swedish use is obtained from the sea-water plant built in Norway by the Germans during the war, but Wedaverken

FOREIGN REPORT

Wedaverken plant at Sodertalje is said to be typical of setting in which Swedish metalworking is located

Part of machine shop at Wedaverken. Much of casting is in permanent molds, some is sand and die casting



1100-ton extrusion press and rotary-hearth furnace. Plant also has equipment for press forging

obtains special aircraft alloys from England.

Top labor rate is $1.25 an hour, but this has more buying power than the same amount in the US according to Mr Lind. The work week is 48 hours, with some talk of reducing it to 45.

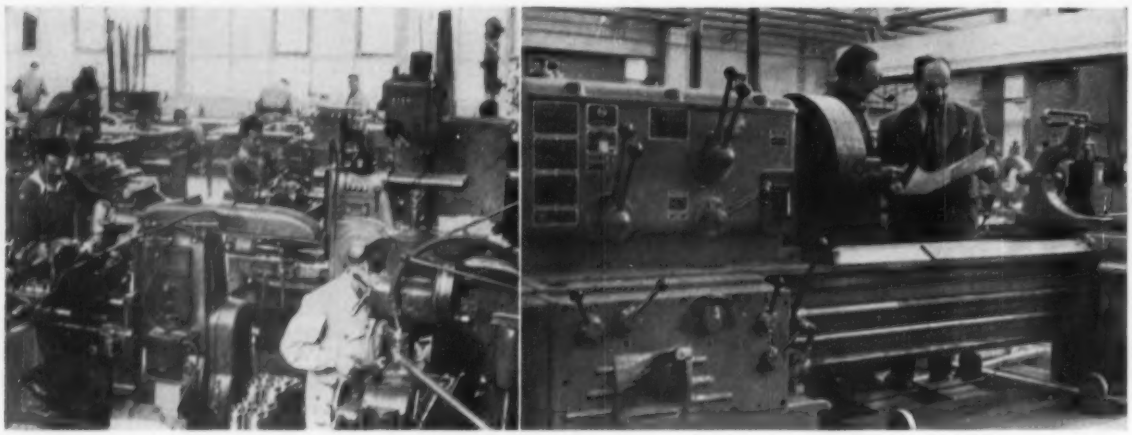
Labor Shortage

However, there is an acute shortage of labor in Sweden even though there are now 120,000 foreign workers in the country. "The housing situation is dreadful," Mr Lind said, with people "queueing up for years for a flat."

The light-metal industry is growing rapidly in Sweden. Particularly the use of permanent-mold casting (which they call gravity-die casting) and die casting in both aluminum and magnesium is on the increase in Scandinavian countries.

Assembly bench for Mobila circulation pump which requires no packing box. Motor and pump are a single unit with impellor vanes inside the hollow armature of the motor. Test stands for assembled pumps are seen in background

FOREIGN REPORT



Jugoslavia's Biggest Machine Tool Plant . . .

BUILT AT THE END OF WORLD WAR II, Jugoslavia's Prvomajska Machine Tool Factory at Zitnjak employs some 1700 workers in manufacturing various sizes of universal lathes, drilling and grinding machines, and air hammers. Largest of Jugoslavia's three machine tool plants, Prvomajska exports part of its production to the Near East, India, Burma, South America and Australia. Left: one of the production shops. Right: engineers inspect one of the lathes made at Prvomajska

World Newsbriefs (McGraw-Hill World News)

Willy Motors Inc is planning to spend $3.4 million on an engine plant to be built at Sao Paulo, **Brazil.** The plant will have a 1500-engines-a-month capacity, will enable Willys to team up made-in-Brazil engines with made-in-Brazil Jeeps—the only way in which it can qualify for local manufacture under new Brazilian regulations intended to bolster auto manufacture in Brazil . . . Solar Aircraft Co, San Diego, Calif, has concluded an agreement with **Japan's** Nissho Ltd, whereby Nissho will sell Solar's aircraft and engine components, welding fluxes, and bellows and expansion joints in Japan . . . FIAT will get $5 million of the $75 million granted to **Italy** by the International Bank for Reconstruction and Development. It will enable FIAT to open its Naples Works for the building and assembly of automobiles. Also assigned $1.3 million by the Bank, Officine Viberti will set up a motor truck body plant in Naples . . . **Argentina** is getting a $208-million metalworking plant, Industria Argentina de Fundiciones de Hierro y Acero SA, which will make railway wheels, motor vehicle cylinder blocks and castings beginning early next year . . . **Japan's** Automotive Industrial Association is planning to export 16 different types of vehicles (passenger cars, buses, trucks and fire engines) to the **Philippines** as a promotional stunt for Japanese-made vehicles. The Philippines are Southeast Asia's No. 1 vehicle market today . . . **West Germany** turned out nearly twice as much textile machinery this year as it did in 1955—exporting nearly two-thirds of it . . . **India's** manufacturing potential is "colossal," according to Sir Eric Coates, chairman of **Britain's** Heavy Engineering Mission to India. Manpower is unlimited and the quality of India's raw materials for metalworking is of high standard, he says. The Mission is reporting on India's efforts to set up foundries, forges and other metalworking plants . . . Cummins Diesel Engine Co, Columbus, Ind, is setting up a $4-million diesel engine plant at Shotts, Lanarkshire, **Scotland.** Plant will be in full operation within two years, will employ 800 . . . **Britain's** Battelle Institute, London, has developed several new tin-lead alloy solders with unusually long life at temperatures around 223 F. They can be used to solder car radiators, where operating pressures to 16 psi are used . . . **West Germany** has reportedly given **Britain's** Rolls Royce a several-million-dollar order for engines to power Germany's new fleet of armored vehicles . . . **Jugoslavia** has offered to buy $25 million worth of **British** agricultural machinery, most of it for Ferguson tractors. Trouble is, the Jugoslavs can't or won't pay cash, prefer long credit terms. If this falls through, Russia may foot the bill . . . **Germany's** Karl Kaessbehrer Fahrzeugewerke, Ulm, has sold 50 luxury buses to Transcontinental Bus System, Dallas, Texas, which claims it can't get engines of comparable quality in the U S . . . Farrel-Birmingham, Ansonia, Conn, has opened a branch office at Piazza della Republica 32, Milan, **Italy,** to sell its machine tools and metalworking equipment to Europe and the Near East . . . Ford will build a new automobile plant on the outskirts of Melbourne, **Australia,** will also expand its Geelong, Victoria, works . . . **Brazil's** infant auto industry is moving into high gear: Mercedes-Benz is opening a truck plant near Sao Paulo; Borg-Warner will make auto cylinders and transmission parts at Sao Paulo; Fabrica Nacional de Motores is making a deal with Italy's Fiat to make a line of Fiat tractors under license (it already makes Fiat trucks), will build a $7-million plant to do it . . . Four cargo passenger ships have been ordered from **West Germany's** Deutsche Werft Shipyards by the **Israeli-U S** enterprise, El-Yam Ltd. They'll cost $10 million. Another four ships, costing $16 million, are slated by 1960.

C J Wilson has joined The Bullard Co as director of manufacturing. He was formerly works manager of Mergenthaler Linotype Co, Brooklyn

E L Oehling (left), manager of Hydraulic Press Mfg Co's central district sales office, has been promoted to general sales manager. **R J Lindsey**, director of engineering, has been named vice president, engineering

Names in the News . . .

Harry B Bentley, manager of production planning at Chrysler Corp's Engine Division, has been named manager of the company's Trenton, Mich, plant.

James J Welker has been elected vice president in charge of operations of Clevite Corp. Mr Welker has served for the past five years as NY regional executive of Ford International, responsible for Ford operations in England and Germany.

Enoch While, chief inspector at Allis-Chalmers Norwood (Ohio) Works since 1947, has been named works manager there to succeed **J F Costigan,** recently appointed assistant director of manufacturing, Industries Group.

Clyde R Dean, Jr, director of export sales of Yale Materials Handling Division, Yale & Towne Manufacturing Co, has been promoted to general sales manager. **Francis J Dunleavy** has been named assistant general manager of the division.

Richard Owen has been appointed general manager of Martin Grinding & Machine Works, Chicago. He succeeds **William B Grant,** who has resigned.

J Scott Parrish, Jr, president of Richmond Foundry & Manufacturing Co, Richmond, Va, has been elected president of the Gray Iron Founders' Society. **A M Nutter,** treasurer, E L LeBaron Foundry Co, Brockton, Mass, has been named vice president.

Robert M Tobin has been appointed sales manager of the Powrworker Section, Industrial Truck Division, of Clark Equipment Co. He has been acting sales manager since 1955.

Carl E Rowe, assistant general manager of the Milwaukee Valve Co, has been appointed vice president, general manager, and a director of the firm.

William B Gurney, formerly assistant chief engineer for Solar Aircraft in San Diego, Calif, has been appointed west coast engineering and sales manager for the Chandler-Evans Division of Pratt & Whitney Co.

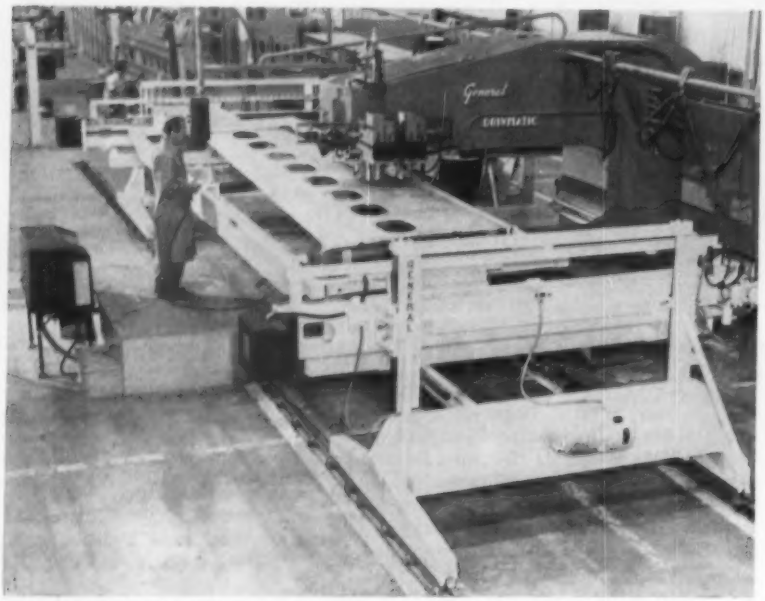
Robert S Miller has been named works manager of the western division of Servomechanisms, Inc, Hawthorne, Calif. Prior to the appointment he was associated with Specialties, Inc, Syosset, LI, as assistant to the president.

James H Broderick has been appointed sales manager of Greenfield Tap & Die Corp's Geometric Tool Co Division. H has been serving as field sales manager since 1949

Edward H Jacobs, formerly manufacturing manager for Paragon Gear Works, has been named works manager of Abrasive Machine Tool Co

Frank J Hoder, Jr, has been appointed general manager of Brown & Sharpe Manufacturing Co's new Pump Division. He was formerly marketing manager of Studebaker-Packard's Government & Industrial Products Division

New Shop Equipment



TAPE-CONTROLLED RIVETER runs on a narrow-gage railway track 60 ft long. Unit drives fuel-tight slug rivets without using soft metal sleeves or fuel sealant compounds

PATTERN OF HOLES punched in a reel of 35-mm motion-picture film controls the huge machine. Three separate tapes activate three driving mechanisms to control machine movements

Tape-Controlled Drivmatic Riveter Produces 20-ft-long Wing Segments

Giant riveting machine, Drivmatic Model G-39 ACV, has increased a production operation 400% in the Hawthorne, Calif, plant of Northrop Aircraft. Machine, manufactured by General Riveters, is similar in design to that company's previously announced Drivmatic (AM—Jul 18 '54, p160), but has been modified by Northrop tools and techniques. Unit, which is pushbutton controlled by one operator, mass-produces 20-ft-long fuel-sealed wing segments automatically. Fuel-tight rivets are made without use of soft metal sleeves or fuel sealant compounds.

Machine is capable of driving 7 slug rivets per min. No further riveting work need be done when machine has finished its work. Control boxes at either end of the machine's carriage each contain a tape to control transverse travel of work. A larger box to rear of operator contains a tape which controls longitudinal travel of the carriage and also the several tools which drill, ream, and countersink holes. On the latter tape as many as 7 rows of holes, each controlling a different operation, may be punched across the tape.

Set-up of the device is accomplished by sighting in a master part with a transit or sight level. Each rivet hole is thus located to pinpoint accuracy, and the machine's three tapes are then punched with data corresponding to the positioning and cycling requirements according to indicators located at the edge of the tape. Holes are punched in opaque 35-mm film; a small, bright light beneath the tape activates photo-electric cells which guide the machine.

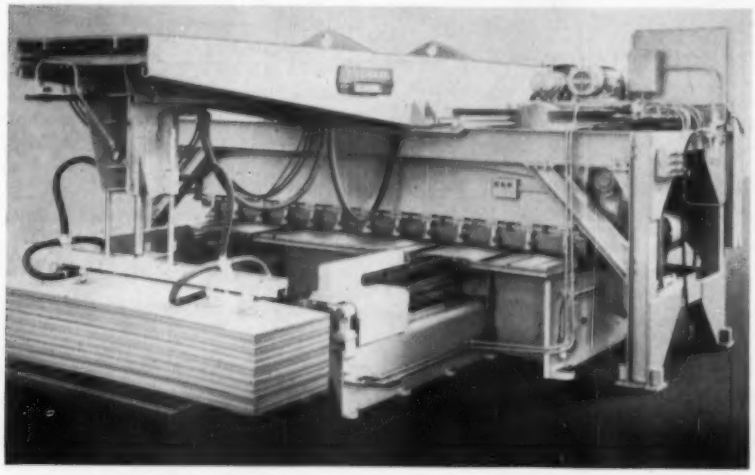
Punched holes in the tape carry out the following sequence of operations: Drilling head (positioned by electronic eye which shuts off rapid tranverse in anticipation of inertia of the 3-ton carriage) drills, reams, countersinks, and counterbores in one pass with a single tool. Slug rivets are fed into a rivet injector, which in turn places rivet in "rivet fingers" for transfer into the hole under the top-rivet set. The top-rivet gun set then bottoms the rivet on an opposing rivet set which has moved automatically to the proper depth beneath the rivet hole. Other punched holes automatically lower the bottom rivet set to clear projections such as ribs or stiffeners as the table travels and then raise it again to its proper location.

Rivets are driven from the bottom at 16,000-lb pressure, then shaved flush with the skin. Curved part of work is kept horizontal at the drilling and riveting heads by twin cams which elevate and tilt work to the proper attitude as the carriage travels.

Three types of drive are used on the machine: longitudinal travel is governed by a Vickers hydraulic system; transverse travel is powered by two reversible-piston Keller motors; and up-and-down motion is caused by drivescrews driven by Century Electric geared electric motors.

General Riveters, Inc, Buffalo, NY

Materials and Parts . . .



Cincinnati Auto-Shear Provides Automatic Sheared Blank Production

Auto-Shear is designation for unit composed for standard 1812 Series shear employed in conjunction with automatic handling equipment to form an automatic sheared-blank production unit. Auto-Shear picks up unsheared plate, deposits it on the shear table, feeds it into the shear against the back gage, makes the cut, conveys the sheared blanks beyond rear of the machine, picks them up, and stacks them—all automatically.

Pickup of blanks is done by suction cups carried on a pneumatically powered trolley. Automatic feeding is accomplished by two air-powered feeder units. Shearing of any thickness of metal within capacity of machine can be performed without changing knife clearance; hydraulic hold-downs exert pressure equally. Automatic removal of sheared pieces is accomplished by a motor-driven conveyor; a pneumatically powered trolley which carries suction cups is used to stack finished work.

Power sources for the various materials-handling components can be varied to suit individual.

Cincinnati Shaper Co, Cincinnati 25, Ohio

Kidde Ultrasonic Alarm System Protects Against Burglary

Ultrasonic Alarm is designation for system designed for protection of plants against intrusion. System makes use of ultrasonic waves with a frequency of 19,200 cps traveling at about 1130 ft per sec; this inaudible sound saturates the area that is being scanned, will trigger an alarm if there is the slightest movement in the area being protected.

System makes use of the Doppler effect in its operation: when an object that reflects sound is moving, the original "tone" of the sound rises or falls.

In the area being protected, a transmitter and receiver are connected to a master control which compares the note being transmitted with the note being received. As long as the notes are the same, no signal will go to the alarm circuit; but a moving object will send a different note to the master control, which then senses the difference in the two notes and instantly sends a signal to a monitor panel (placed anywhere) that triggers an alarm.

Basic set is said to protect an area of 4000 sq ft and a volume of 60,000 cu ft. Any number of units can be installed in series to protect a larger area. System operates on ordinary lighting current.

Walter Kidde & Co. Inc, Ultrasonic Div, Belleville 9, NJ

. . . including

MACHINE TOOLS AND ATTACHMENTS

Surface Grinders 182
Deep-Hole Drilling Machine 183
Hydraulic Slotter 184
3-D Milling Machine 184
Center-Drive Facing Lathe 186
Radial Drill 186
Vertical Milling Machine 196

TOOLS AND ACCESSORIES

Flaring Tool 192
Threading Tool 194
Coolant System 196

FORMING AND CASTING

Hydraulic Forging Press 183
Plastics Molding Presses 188

HEAT-TREATING AND WELDING

Ultrasonic Soldering Iron 182
Welding Manipulator 190
Portable Welding Equipment 198

CLEANING AND FINISHING

Ultrasonic Cleaner 184
Automatic Processing Unit 192

PLANT SERVICE EQUIPMENT

Roller Skid 186
Hydraulic Rescue Equipment 190
Portable Crane 194

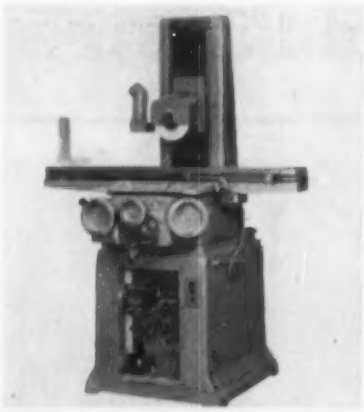
INSPECTION AND LAYOUT

Automatic Micrometer 188
Periscope 198
Temperature Controllers 201

PARTS AND MATERIALS

Investment-Casting Alloy 183
Aluminum-Oxide Coatings 194
Heat-Resistant Rubber 214

REID-O-MATIC 824 SURFACE GRINDER handles 8 x 24-in. work, has 66 x 10-in. worktable. Electrical controls are mounted in sealed cabinet in base. Unitized construction of all controls permits quick replacement



NO. 618 PRECISION SURFACE GRINDER has been redesigned for greater precision and simplified operation. Models with powered table or powered crossfeed are offered, as well as hand-feed models

Two Reid Surface Grinders Offer Design Changes and Innovations

The Reid-O-Matic 824 power-operated surface grinder, designed for both production and toolroom use, has been added to company's line. In addition, company's 618 precision surface grinder has been redesigned to incorporate many design changes.

Reid-O-Matic 824 handles work up to 8 x 24-in. size, and is designed to be controlled by pushbutton. Dial-controlled speed of the table is variable from 5 to 75 fpm. Cross-feed drive is dial-controlled for infinitely fine adjustments from 0.001 to 0.125 in., and a selector switch controls cross-feed at either or both ends of table travel. Table traverse is through an electric-clutch transmission in which all parts run in an oil bath. Low-pressure automatic lubrication is provided for constant oiling of all way surfaces. Spindle mounts a 12-in. wheel for 1800-rpm operation.

Other features of the 824: floor space, 93 x 51½ in.; weight, 4000 lb; clearance under wheel, 15 in.; 2-hp motorized spindle with 4-in.-dia barrel mounted in head by four special bill binders.

Second grinder, No. 618, is offered in three models: 618P with powered table and powered crossfeed; 618PT with powered table and hand-fed crossfeed; and 618H for full hand-feed operation. Reciprocating table is driven by a cogged timing belt, providing a non-slip drive and eliminating chain chords on finished workpieces. Cross-feed operates within 1½ in. of the end of stroke in both directions, and is adjustable from 0.006 to 0.100 in. Ball bearings have been added to the elevating shaft on the motorized grinding spindle to make elevation easier. Both the table motor and spindle motor have overload protection.

Other features: floor space, 71 x 43½ in.; weight, 2200 lb; 1-hp cartridge-type motorized spindle; ½-hp table traverse motor; work capacity, 6 x 18 in.; work table, 51 x 8 in.

Reid Brothers Co, Inc, Elliott St, Beverly, Mass

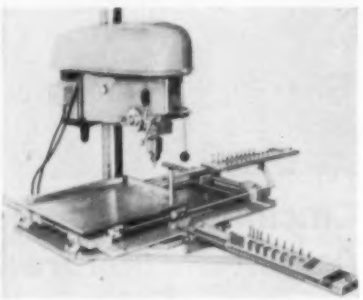
Ultrasonic Soldering Iron Solders Aluminum Without Flux

Model E-7587-M ultrasonic soldering iron, made in England by Mullard, Ltd, is capable of soldering aluminum without flux by completely removing the oxide film on the metal surface. The iron, together with its power unit, applies sound waves through the molten solder to the surface of the metal, where a "cold boiling" effect, called cavitation, is produced within the solder; cavitation bubbles remove all oxide film from the metal surface and allow a wetting action by the solder, so that tinning takes place.

Soldering iron has a pistol grip and be supplied with a choice of chisel-shaped or tapered copper bit. Iron has built-in bit-heating element as well as built-in servo stability system.

For rapid dipping of small articles, the iron can be replaced by a tinning bath, which operates from the same power unit. Bath consists of a small solder pot ⅞ in. in dia by ¾ in. deep; ultrasonic vibrations are applied to the bottom of the pot.

Distributed by Acoustica Associates, Inc, Glenwood Landing, L I, N Y



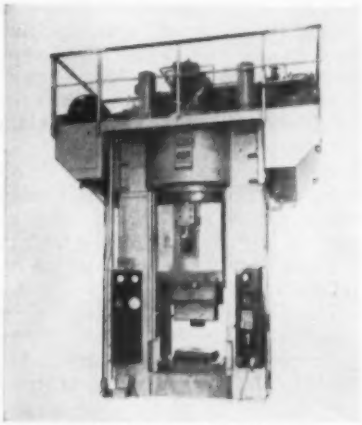
Bayer Drillpress Positioner Reduces Hole-Layout Time

Intended for reducing the time-consuming process of laying out, prick-punching, and checking locations for drilled hole, drillpress positioner can be mounted on any drillpress with swing of 6½ in. or larger. Device can reportedly spot a hole to a tolerance of 0.001 in.

Positioner consists essentially of a chrome-plated 11½ x 14½-in. work-holding table and two extension arms for setting X and Y coordinates. To locate a hole to be drilled, operator sets 2 pins in 2 holes for the X dimension, then repeats this action for the Y dimension. Table is pulled into position, work is held against table guides, and then work is spotted with a center drill. Work may then be drilled in place or removed to a drillpress. Holes may be spotted in 0.001-in. intervals up to 12 in. for the X axis and 6 in. for the Y axis.

When extremely close tolerances are not required, short-length drills can be used to drill work without necessity of spotting with a center drill. If large quantities are to be spotted or drilled from one setting, table can quickly be locked into position to prevent drifting or misadjustment.

Bayer Industries, 240 W Missouri Ave, Phoenix, Ariz



Erie Hydraulic Forging Press Has Electromagnetic Controls

1500-ton hydraulic forging press, designed for no-draft, non-ferrous forgings, is a rigidly built, self-contained unit with inserted cylinder construction for added strength. Electromagnetic controls allow instant response to fingertip control by operator. All controls are grouped on one panel. Press is arranged for semi-automatic operation, so that the forging cycle can be pre-set to incorporate any desired advance, press, release, and return speed and tonnage.

Press can be operated manually; manual control is easily detached from the control panel by the operator, who is then free to control the press from any nearby position. This remote-control feature is reported especially valuable when die alignments are being checked from all four sides of the press.

Unit utilizes hydraulic knockouts which can be set to eject forging from the die at any position in the cycle. Guide system is adjustable to insure accurate die alignment; it requires no shimming, and adjustment can be made in only one hour.

Other specifications: platen size, 48 x 48 in.; opening, 60 in.; main ram dia, 38 in.; stroke, 48 in.; speeds, 400 ipm advance, 0 to 27 ipm press, 0 to 27 ipm release, and 360 ipm return.

Erie Foundry Co, Erie, Penna

Constant-level oiler will automatically maintain the oil in a bearing reservoir at a constant level. When the oil level in the bearing recedes because of oil consumption, the liquid seal on the spout inside the oiler is temporarily broken; air from the air intake enters the oiler reservoir, releasing oil until a seal and the proper level is again restored.

Oil-Rite Corp, 2386 Waldo Blvd, Manitowoc, Wis

Lahr Deep-Hole Drilling Machine Can Drill 24-in.-deep Holes

Model 662-M-1 deep-hole drilling machine is a massively built unit which reportedly can drill to a depth of 24 in. with a maximum drift of only 0.001 to 0.0015 in. per ft. of depth (depending on quality of workpiece). Drill spindle can operate over a 36-sq-ft area without any resetting of work. Rapid indexing controls eliminate layout and drill jigs.

Company points out that close control of drift allows a small area to contain as many holes as a much larger area might where drift is not so closely controlled. In effect, no appreciable tolerance has to be considered for drift, and the remaining wall thickness between holes can be calculated for working strength only.

A single-flute gun drill is used for the machining operation, together with a coolant-wash combination. With the proper feed, a diameter tolerance of ± 0.001 in. and No. 6 micro-finish has been obtained. Drill spindle, with an integral dc motor, is activated by hydraulic feed and is infinitely adjustable within a range of 300 to 5000 rpm.

To cover the large work area, the drill spindle operates within a 6 x 6-ft horizontal-vertical range. Because the drill bushing adjusts from 0 to 12 in. longitudinally, it extends into work indentures and actually increases the range of the equipment to 36 cu ft.

Lahr Machine & Tool Corp, 3400 Maplewood Ave, Toledo 10, Ohio

High-Temperature Alloy For Investment Casting

GMR-235 is the designation for alloy intended for investment-cast turbine wheels, buckets, and vanes for use at temperatures in excess of 1400 F. Alloy is a nickel-base alloy containing chromium, molybdenum, iron, and boron, with aluminum and titanium as precipitation-hardening agents.

Alloy is reported to have a higher yield strength than any other production alloy with comparable strength above 1400 F. It is also said to have good room-temperature ductility, very low strategic alloy content, and remarkable resistance to overaging at service temperatures for periods over 1000 hr.

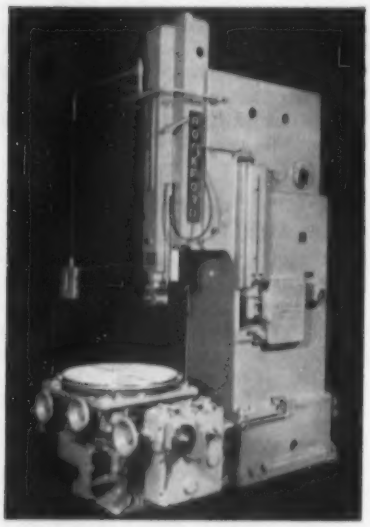
Haynes Stellite Co, Div of Union Carbide & Carbon Corp, 30 E 42nd St, New York 17, NY

Alcar Ultrasonic Cleaner Handles Small Parts

Low-frequency ultrasonic cleaner consists of an electronic generator delivering up to 100 w of energy to crystal transducers mounted on a 1-gal stainless-steel tank. Cleaner can be used for small-parts cleaning, blind-hole washing, removal of radioactive contamination, printed-circuit cleaning, and other difficult cleaning operations.

Two cleaning tanks may be used alternately on the unit without disconnecting either one, so that one tank may be used for removing large amounts of soil and the other for final cleaning, or two different solutions may be used. The only controls are an on-off switch, a frequency-adjusting knob, and a toggle switch to operate either transducer. Unit sells for $475 with one cleaning tank.

Alcar Instruments, Inc, 17 Industrial Ave, Little Ferry, N J



Rockford Hydraulic Slotter Has Special Ram Drive

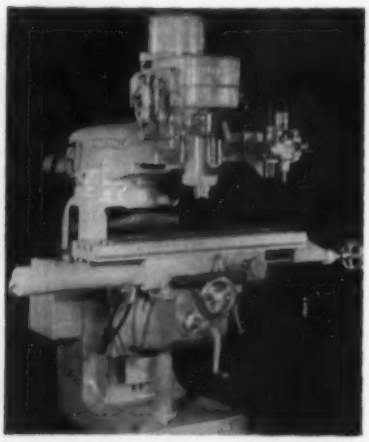
Model SA 36-in.-stroke hydraulic slotter is a rugged machine which can handle large, awkward work, irregular sections, internal surfaces, and angular and rotary cuts.

Machine features a unique combination of mechanical leverage and hydraulic control for the ram drive. The torque-arm drive permits an infinite speed adjustment from 40 to 100 fpm with constant horsepower characteristics. Speeds below 40 fpm are available by means of a flow-control valve. Ram reversals are said to be fast, smooth, and accurate over the full range of the machine.

Machine is provided with wide-range longitudinal and transverse table travel plus 360° rotary-table movement. A dividing head furnishes accurate spacing of keyways, serrations, gear teeth, and other work requiring precision indexing.

Other features include power rapid traverse in all directions stroke-length adjustment when the ram is in motion, and a mechanically balanced ram with a tilt of 10° from vertical. A 15-hp variable-delivery, radial-piston pump is used for hydraulic power. Main castings are semi-steel, adequately ribbed for maximum rigidity.

Rockford Machine Tool Co, Dept S, 2500 Kishwaukee St, Rockford, Ill



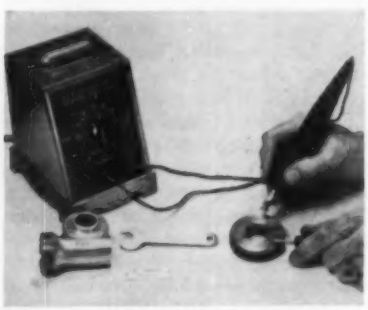
Gorton Mastermil Is Equipped With Trace-Master Hydraulic Controls

The standard Gorton Mastermil—a swivel-head, turret-type, vertical machine—can be equipped at the factory with hydraulic control to the knee, to the table and ram, or to all three elements to provide three-dimensional hydraulic tracer control. Heart of the control unit, called Trace-Master, is a valve consisting of one or more spools or pistons which open and close metering orifices to control the flow of oil to hydraulic pistons, which in turn drive various machine components.

Adjustment of the tracing stylus permits feeding work in any direction by an imperceptible deflection of the stylus, which is so sensitive that cutting is done in both upward and downward motion. Trace-Master head is mounted on a cross-compound bracket which provides adjustments of approximately 9½ in. longitudinally, 3¾ in. crosswise, and 4 in. vertically. Cutter and tracing stylus can be of the same size, so that no test cutting is required to formulate a correct cutter-stylus relationship.

Trace-Master control is offered in three versions: 180° model offers vertical control only; 360° model controls lateral movement with cross and longitudinal hydraulic feed; and the 3-D model actuates the ram for cross feeding, the table for longitudinal feeding, and the knee for vertical feeding. Machines are furnished complete with hydraulic tank and pump, and in the 3-D model an additional convection oil-cooling unit is also furnished.

George Gorton Machine Co, Racine, Wis



ELECTRIC VIBRATING PEN called the Actograp will permanently mark, engrave, or etch all metals, ferrous or non-ferrous. Instrument produces a continuous arc by means of a magnetic vibrating system. Selector switch on transformer permits adjustment of the marking point for etching thick or thin lines to the desired depth. Pen reportedly does not heat up and is safe, for the current is reduced by the transformer to from 2 to 7 v—*Newage International, Inc, 222 York Rd, Jenkintown, Penna*

Adjustable Safe-Torque screwdriving clutch, designed for use with Keller Tool air-powered screwdrivers, provides accurate control of torque under wide range of driving conditions from free running to gathering. Clutch is rated from 10 to 108 in.-lb; can be used for driving either RH or LH threaded fasteners.

Keller Tool Div, Gardner-Denver Co, Grand Haven, Mich

The above preformed tungsten carbide parts (shown unfinished) required little work after sintering.

You can save time and money by using preformed carbide parts*

**. . . Valenite carbide preforms reach you faster —require far less finishing before they go to work!*

Here's Why . . .

1. Through Valenite's advanced production techniques, you get premium-grade carbides (and premium performance) at no increase in price over regular carbides

2. Valenite gives you closer tolerances on preformed parts. You cut grinding and finishing time and expensive diamond wheel usage

3. At the new Valenite plant, your preformed carbide parts go into production at once — without red tape delays in the office

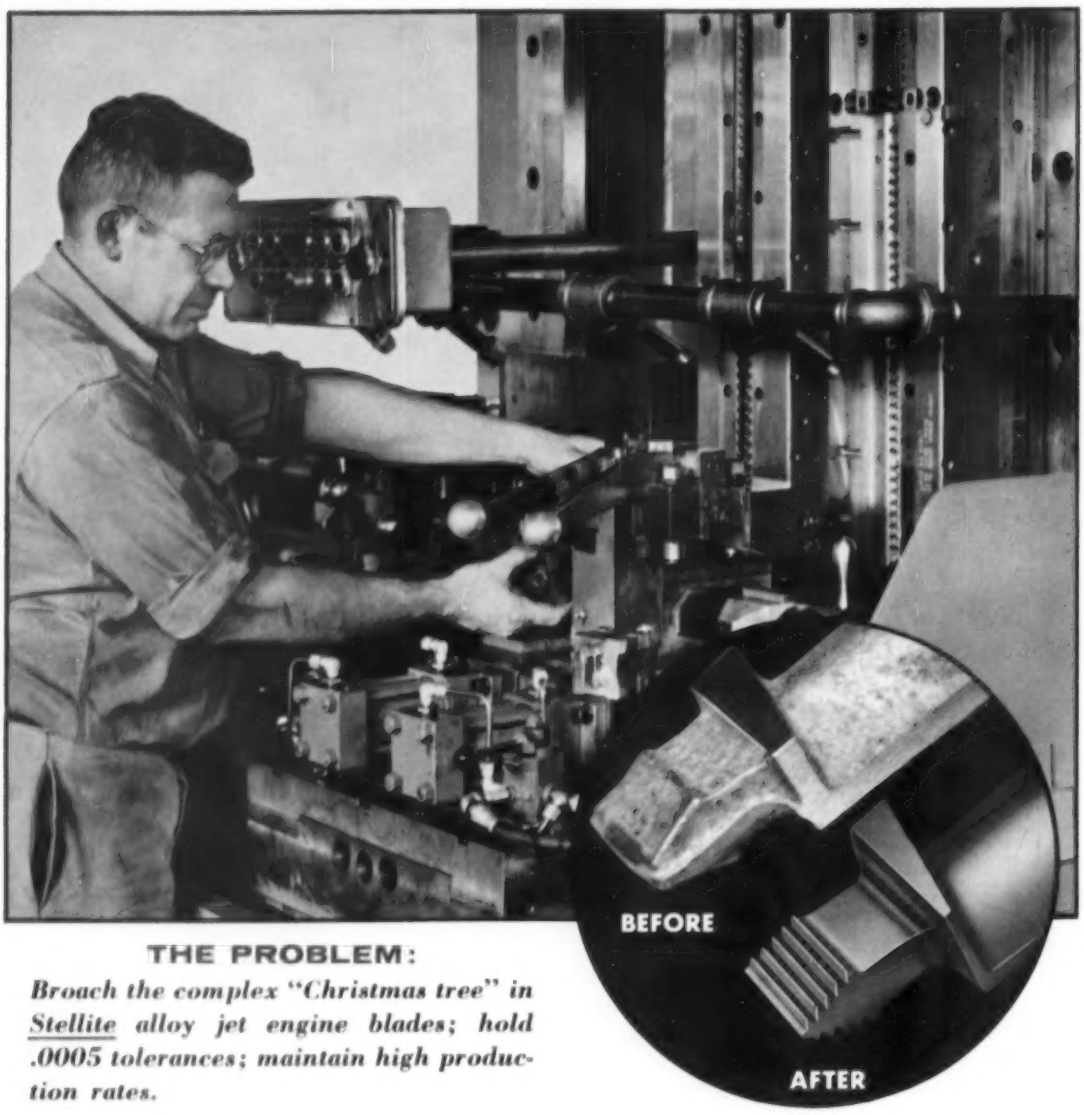
4. Valenite maintains a staff of specialists in carbide preforming. Their assistance will save you money, give you improved on-the-job carbide performance

Maybe you can save money *right now* on your carbide preforms, or profitably use preforms in place of modified standards. Why not send your prints to Valenite for study, recommendations and a quotation? Or ask for your Valenite field man to call.

Write to:
TECHNICAL SERVICES DEPARTMENT

VALENITE
METALS CORPORATION
Box 205, Royal Oak, Michigan

Solved – a tough broaching problem!



THE PROBLEM:

Broach the complex "Christmas tree" in Stellite alloy jet engine blades; hold .0005 tolerances; maintain high production rates.

Conventional broaching tools failed to do the job and were worn out after only a few passes through this tough material. But, by using rugged equipment, an ingenious tooling setup, and Valenite vacuum-sintered carbide on the broaches, Detroit Broach and Machine Company, of Rochester, Michigan, solved the problems of this "impossible" job.

Say Detroit Broach engineers: "Broaches tipped with Valenite carbide hold up amazingly well on the jet blade job. Also, the preformed carbide blanks arrive at our plant exceptionally close to finished dimensions, thus our finishing work is cut to a minimum. Our customer is pleased with the results we were able to give him on this job; we are pleased with Valenite quality and service."

Maybe you have a tough machining job in your plant where VALENITE carbide can cure production headaches. And remember . . . you get faster delivery on money-saving preformed carbide parts from Valenite!

FREE . . . your copy of the Valenite Handy Reference. Packed with useful tables and formulas. The most useful book of its kind. Write for your copy (on your company letterhead, please.)

VALENITE®
METALS

Division of the Valeron Corporation
Box 205 • Royal Oak, Michigan

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 STANDARDIZED PRESS CLUTCHES—*Fawick Airflex Div, Fawick Corp, 9919 Clinton Rd, Cleveland 11, Ohio.* Illustrated bulletin ML-172 describes complete line of package applications for modernization of presses and similar machinery with pneumatic clutch and brake. Packages consist of Fawick CB Airflex clutches, CS brakes, timing rotorseals, high-speed clutch controls, and new flywheels mounted on anti-friction bearings. Selection and application data included.

2 SPEEDS AND FEEDS FOR OXIDE CUTTING TOOLS—*Diamonite Products Div, US Ceramic Tile Co, Canton 2, Ohio.* Chart of recommended speeds and feeds for use in turning various materials with Diamonite tools also lists suggestions to insure proper use of tools.

3 AUTOMATIC STAMPING PRESS—*Alpha Press & Machine, Inc, 9881 Freeland Ave, Detroit 28, Mich.* 4-page catalog illustrates and describes features of 75-ton double crank direct drive precision press for long unbalanced progressive die stampings. Unit does not require a pit; operation is at shoulder level of operator. Specifications and engineering drawings included.

4 RADIUS CUTTING MACHINE—*Special Machinery Co, Winsted, Conn.* 4-page illustrated folder contains information on Radii Model 11 designed to cut radius on square, rectangular, flat, or round material of any size up to 1¼ in. thick by 2½ in. wide.

5 SPIN TESTING, BRIQUETTING, PRESSING MACHINES AND EQUIPMENT—*George L Day Co, 1227-1231 Niagara St, Buffalo 13, NY.* Bulletin 756 presents illustrated descriptions of automated Spintest machine for cutoff saws and grinding wheels, single testing up to 15,000 rpm; automated high-speed hydraulic press for abrasive, refractory, powder metal and ceramic briquetting, 75-ton capacity; and presses designed for special metal-working applications.

6 HYDRAULIC GENERAL PURPOSE PRESS—*Watson-Stillman Press Div, Farrel-Birmingham Co, 300 Alsene Rd, Roselle, NJ.* 4-page bulletin 371 covers features and specifications of down-acting unit for short production runs in metal forming, straightening, coining, forging, light hobbing, and for general testing and die tryout. The 150-ton capacity press has 12-in. stroke.

7 STATIC CONTROL LOGIC ELEMENTS—*General Electric Co, Schenectady 5, NY.* 8-page bulletin GEA-6678 defines principle, lists advantages, describes components of general-purpose system. Elements illustrated, operational data, installation and maintenance details provided.

TOOLS AND ACCESSORIES

8 CARBIDE TOOLS—*Nelco Tool Co, Manchester, Conn.* 50-page catalog covers 700 carbide and carbide-tipped tools. Illustrations, description, specifications, prices given for each.

9 RESIN AND METAL BONDED DIAMOND WHEELS—*Delta Diamond Wheel Corp, 1408 Utica Ave, Brooklyn 3, NY.* 32-page illustrated catalog 717 gives detailed data on improved series of wheels with steel, nickel, and bronze bonds, and resin bond for dry grinding. Diamond wheel dressers and tools also covered.

10 OPTICAL TOOLING—*Charles Brunsing Co, 4700 Montrose Ave, Chicago 41, Ill.* 20-page illustrated booklet explains theory, principles, practice; applications. Complete line of Brunson instruments and accessories pictured and discussed.

11 VISES AND WORK-HOLDING FIXTURES—*Universal Vise & Tool Co, Parma, Mich.* 16-page catalog 9156 describes and illustrates features and applications of line including machine tool and angle vises, adjustable angle plates and lathe fixtures, work-holders for drill-presses, large capacity mill table vises, and parallel clamps. Specifications and ordering information.

12 COLLOIDAL DISPERSIONS—*Acheson Colloids Co, Port Huron, Mich.* Illustrated bulletin 423 discusses 'dag' dispersions for high-temp lubrication of mechanical equipment. Applications and recommended procedures discussed.

13 RECEDING CHASER COLLAPSIBLE TAPS—*Landis Machine Co, Waynesboro, Penna.* 8-page bulletin G-95

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST. 12-3-56 Not good after Feb. 3, 1957

(duplicate)

(duplicate)

(duplicate)

(duplicate)

(duplicate)

(duplicate)

(duplicate)

tables and formulas. The most useful book of its kind. Write for your copy (on your company letterhead, please.)

Division of the Valeron Corporation
Box 205 • Royal Oak, Michigan

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

FYI
FOR YOUR INFORMATION

gives illustrated details on Style LL for stationary or rotary applications. Four sizes of tap bodies utilizing detachable heads provide wide range coverage. Design features, specifications, diagram of clearance included.

14 FLEXIBLE SHAFT MACHINE—*Stow Manufacturing Co, 443 State St, Binghamton, NY.* 8-page catalog 57 contains information on ¼-hp multi-speed or single-speed units. Attachments and accessories for variety of applications pictured and described. Machines illustrated are available with truck, pedestal, bench, and suspension mountings.

15 TAPS—*Beloit Tool Corp, 18000 Milwaukee Rd, Beloit, Wis.* 6-page catalog contains detailed tabular data on standard and special taps; prices included.

16 MOLY-SULFIDE LUBRICANT ADDITIVE — *Climax Molybdenum Co, 500 Fifth Ave, New York 36, NY.* 12-page illustrated bulletin Lu-6 explains Moly-Sulfide's function as a lubricant additive. Lubricating characteristics summarized, advantages outlined, applications listed.

HEAT TREATING AND WELDING

17 HEAT-TREAT FURNACES — *Surface Combustion Corp, Toledo 1, Ohio.* 8-page catalog SC-175 pictures and describes standard rated units for all types of heating applications ranging from small laboratory models to large continuous brazing furnaces.

18 SUBMERGED ARC WELDER—*Lincoln Electric Co, Cleveland 17, Ohio.* 20-page catalog contains illustrated information on Lincolnweld models for ac and dc automatic welding; attachments pictured and described, power sources discussed, selection of electrodes and fluxes covered.

19 LOW-TEMP WELDING ALLOYS—*Eutectic Welding Alloy Corp, 40-40 172nd St, Flushing 58, NY.* "Selec-Tie" wall chart (TIS 2616) of 150 alloys lists torch and arc welding applications for variety of materials; gives bonding temperatures and tensile strengths; designates alloys suitable for inert arc.

20 ELECTRICAL EQUIPMENT FOR ARC FURNACES—*General Electric Co, Schenectady 5, NY.* 16-page bulletin GEA-6351 includes product information and illustrates features of transformers, switchgear, control, and direct-current motors.

21 HIGH-TEMP BRAZING ALLOYS—*Handy & Harman, 82 Fulton St, New York 38, NY.* 4-page illustrated bulletin 22 describes series for brazing stainless and a variety of heat-resistant alloys. Specifications, selection factors, recommended applications given for four Handy Hi-Temp alloys; 6-step procedure described for obtaining high quality joints.

PLANT SERVICE EQUIPMENT

• OVERHEAD CONVEYOR—*Mechanical Handling Systems, Inc, 4600 Nancy Ave, Detroit 12, Mich.* Spiral-bound illustrated manual contains detailed data on five standard lines of Monoveyors ranging from Junior unit for lightest loads and chain pull not exceeding 360 lb per drive unit through 3, 4, and 6-in.-track systems for chain pulls up to 6000 lb. Separate indexed sections deal with application and design, chain and attachments, track, roller turns, traction wheels, takeups, drive units, safety devices and sprockets, carriers and guards. Request direct on company letterhead.

22 "SIMPLE METHODS FOR ANALYZING PLATING SOLUTIONS"—*Hanson-Van Winkle-Munning Co, Church St, Matawan, NJ.* 36-page bulletin discusses analytical principles, use of apparatus and methods for sampling a solution. Detailed outline of necessary steps involved in 28 methods for testing nickel, copper, silver, and other metal-finishing solutions; equipment described, conversion tables included.

23 PRECISION LAPPING—*Penn Scientific Products Co, 1000 Old York Rd, Abington, Penna.* 28-page illustrated manual contains information on precision graded fine diamond powders. Spectrum diamond lapping compounds in 12 standard grit sizes described; procedures for obtaining surface finishes accurately to less than one millionth of an inch are outlined.

24 HIGH-VACUUM PUMPS — *F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Penna.* 28-page catalog 752 on Microvac pumps gives recently increased performance ratings, specifications for complete line, tables of formulas, constants, and conversion factors, solutions to problems of pump selection for typical vacuum systems, and data on maintenance procedures. Installations and applications illustrated.

PARTS AND MATERIALS

25 V-BELT DRIVE ENGINEERING MANUAL — *Mawrey Manufacturing Corp, 2915 S Wabash Ave, Chicago 16, Ill.* 66-page illustrated handbook contains sections on selection,—covering drive service factors, how to select a stock drive, and complete V-belt drive tables for A, B, C, D, and E section V-belts; drive design,—devoted to engineering and tabular data; and a general information section.

26 MICROSPHERE SPINDLE BEARINGS—*Landis Tool Co, Waynesboro, Penna.* 8-page catalog presents illustrated information on bearings used on Landis precision cylindrical grinding machines. Design, operating, and construction features described; typical tool wheel spindle assembly showing bearing pictured and discussed.

27 GYROL FLUID DRIVES—*American Blower Corp, Detroit 32, Mich.* 16-page bulletin 9119 covers drives for ½ to 25-hp applications, describes company's Type T, TM, and VS Class 2 units for use in the low hp range. Fluid drive principle explained; typical performance curves, selection tables, and installation drawings give basic envelope dimensions.

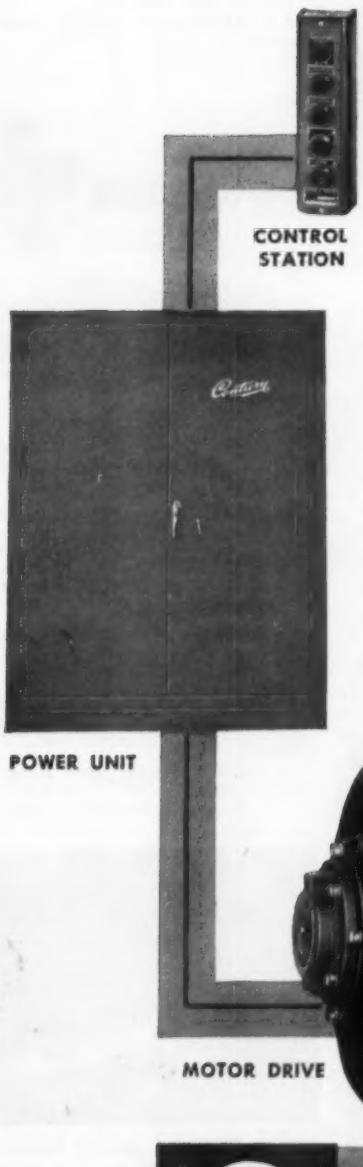
28 SPEED REDUCTION — *Sterling Electric Motors, 5401 Telegraph Rd, Los Angeles 22, Calif.* 12-page illustrated brochure contains information on integral gear motors, speed reducers with separate motors, and speed reducers alone. Design features and selection factors covered.

29 GRINDING WHEEL SPECIFICATIONS FOR TOOL AND DIE STEELS—*Bay State Abrasive Products Co, Westboro, Mass.* Steels are grouped according to grindability or resistance to abrasion; wheel recommendations for various operations given for each class. Variety of methods used in grinding are illustrated.

Co. Address .....
AMERICAN MACHINIST 12-3-56 Not good after Feb 3 1957

Your customers may need this drive...

TO AUTOMATE YOUR MOTOR DRIVEN PRODUCTS...
GIVE THEM PRECISE, VARIABLE SPEED CONTROL...



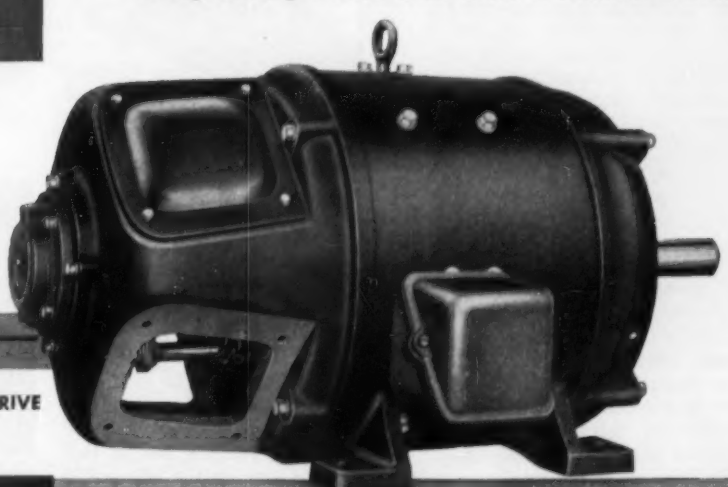
Century Performance-Rated®
SELECTIVE SPEED DRIVE

How many of your customers could use the *full* potential of your product when given automatic operation by a Century Selective Speed Drive? Possibly more than you think.

Here's why. Predetermined, *automatic* manufacturing operations are faster, more accurate than manually controlled operations. A Century Selective Speed Drive on your product will respond to changes in operations—such as varying temperature, pressure, size, viscosity—and *automatically* adjust motor speed to fit the job.

Operating from AC, these drives offer a broad range of DC stepless speed control. They can regulate speed for individual drives or for precision interlocked multi-motor drives . . . can be used for jogging, normal or fast starts and stops, forward or reversing . . . and respond to a wide variety of remote control devices.

Century has more than 50 years' experience in engineering DC motors. For information on any motor application, call or write your nearby Century District Sales Office or Authorized Distributor.



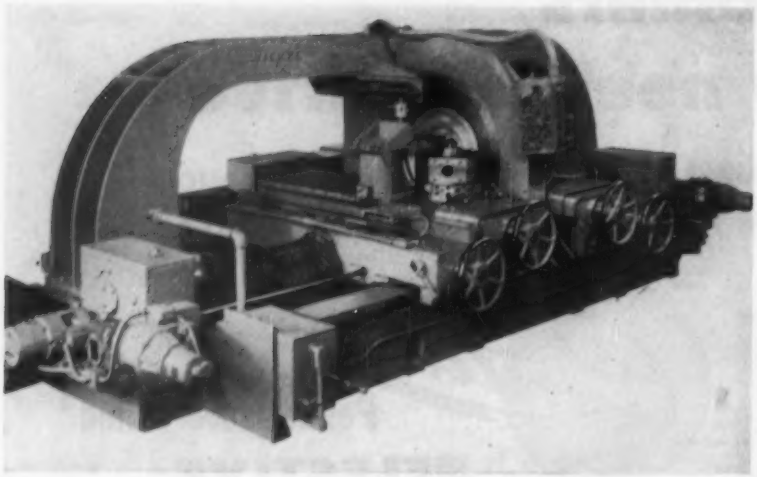
76

Performance-Rated © MOTORS 1/20 to 400 H.P.

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Wickes Center-Drive Facing Lathe Machines 44-in.-OD Disks

Model CDF center-drive facing lathe is designed for profile facing such pieces as turbo-jet engine disks of sizes ranging to 44-in. OD. Cutting tools mounted directly on opposite sides of work simultaneously turn both sides. An electronic feed system equipped with differential potentiometers drives the feed motors in such a manner that proper balance is maintained throughout the cycle.

Company reports that rough, semi-finishing, and finishing passes have been made on parts with a 22-in. diameter and a thickness of 0.0029 in. Parallelism was within 0.001 in.

A cam-controlled, variable-speed drive unit controls spindle speed to provide constant surface speed at any pickoff. Machine is said to eliminate "dishpan" effect common in thin sections machined by conventional methods.

Machine is available in six sizes, with longitudinal travel either way from centerline varying from 24 or 12 in. to 36 or 18 in., depending on model.

Wickes Machine Tool Div, Wickes Corp, Saginaw, Mich

Stereoscopic microscopes in Cycloptic Series incorporate a component called the Magni-Changer, a numerically calibrated cylinder with 16 achromatically corrected optical elements. Desired magnifications are obtained by rotation of the cylinder; magnifications range from 3.5 to 90 X. Wide variety of models is available for both laboratory and general industrial use.

American Optical, Instrument Div, Box A, Buffalo 15, N Y

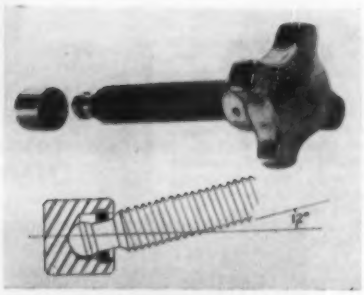
Johansson Radial Drill Provides Linear, Angular Ram Movements

Positioning the drillhead without disturbing work is permitted in radial drilling machine by a combination of linear and angular ram movements. Mounting the ram on roller bearings provides sensitive linear positioning of the drill head; tube column raises vertically and also rotates 360° around its axis, providing both vertical and angular positioning.

Ram rotation permits use of two work stations, one on the adjustable table in front of the machine and another on the fixed platform at machine's rear. Drillhead on ram can be brought up to within 5 in. of column or moved out to drill to the center of a 52-in. circle. Vertical movement of column permits a maximum of 53 in. from spindle nose to working surface, a minimum of 3½ in.

Power is transmitted through geared drive, allowing use of drills up to 1¾ in. in cast iron. Any of eight spindle speeds, from 104 to 1200 rpm, can be selected instantly while machine is running. The No. 4 Morse taper spindle travels 6 in. A smaller machine, with 1¼-in. drill capacity, No. 3 Morse taper, and 5-in. spindle travel is also offered.

I O Johansson Co. 7248 St Louis Ave, Skokie, Ill

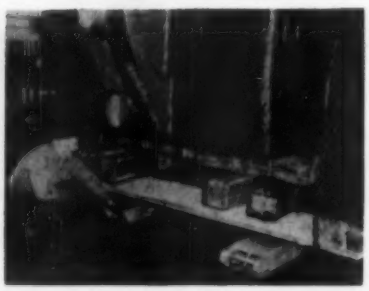


Knob Shoe Assembly Requires No Pin Fastening

Knob shoe assembly for use in jigs and fixtures features a snap ring which eliminates pin fastening. When the round head of the screw is inserted in the snap ring, shoe is held firmly in place after screw returns to its original position. Ball-and-socket design permits angular pressures, provides up to 12° movement in any direction.

Device is available in 12 standard sizes, with special sizes quoted on request.

Standard Parts Co, 1000 Broadway, Bedford, Ohio



ROLLER SKID for moving heavy machinery, called the Mark 6 Multiton, has a rated capacity of 300 tons. Typical application includes use of several of the devices to move the frame of a 4000-ton press weighing 301,000 lb—*Stokvis Edera & Co, Inc, Port Washington, N Y*

How optical gaging helps get Giannini air-borne instrument production off the ground faster.

In the fight for flight that's higher, farther, faster—plane and missile makers want everything smaller, lighter, tighter. Tighter means tolerances today of 0.0002″ to 0.0003″ compared to 0.003″ to 0.004″ a few years ago. That's why more and more manufacturers like aircraft and missile instrument and control maker G. M. Giannini & Co., Inc., Pasadena, Calif., are using Kodak Contour Projectors.

A pulley in one Giannini instrument is less than pencil eraser size, has groove dimension tolerance falling between 0.010″ and 0.011″, four separate angles to check out within 0.30°, a shaft diameter of plus or minus 0.0001″ or 0.0002″. Perpendicularity must be within 0.0003″. Like many aircraft parts, it's made of aluminum alloy.

Before Giannini put a Kodak Contour Projector to work on receiving inspection, getting prototypes of instruments filled with parts like this—and even tighter—used to be a mammoth problem. An undetected off-tolerance part in the master could hold up production or even throw production models out of kilter.

At Giannini, inspectors check incoming parts quickly and accurately with optical gaging, make sure they're right for the prototype. They optically check angles, shoulders, radii, positions, and all critical surfaces on a single projector. Now there's less chance than ever that production parts will be off tolerance once the master has been approved.

If inspecting small parts to tiny tolerances is a large problem with you, you should investigate optical gaging with a Kodak Contour Projector. A Kodak Contour Projector can work production and quality control miracles where control of measurements makes a better product.

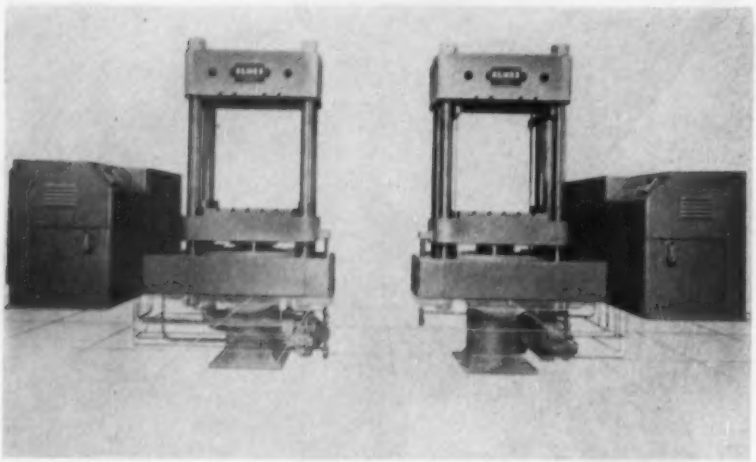
Write for your copy of "Projection Gaging with Kodak Contour Projectors." Even better, ask for the name of your nearest representative, so he can personally explain projection gaging's scope and capabilities.

Inspectors quickly learn optical gaging, because it's simply a matter of looking and comparing. Perhaps you can greatly improve Toolroom, Receiving, Production, and Final inspection with a single unit. There are six models to choose from.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak



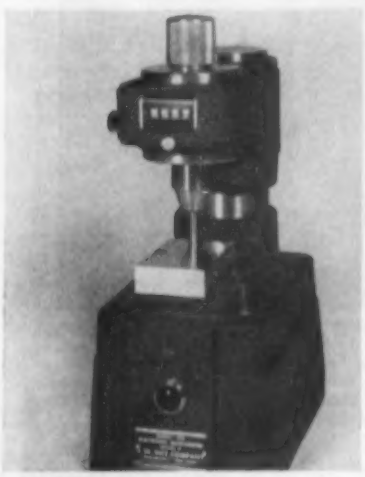
Elmes Plastics Molding Presses Offered in Twin Installation

Hydraulic compression - molding presses in 300-ton version are of 4-column moving-up type, and are identical except that one is equipped with lefthand and one with right hand control and top knockouts. The two presses make a compact installation, and one man can operate both units.

Hydraulic and electrical components and the piping of each press are encased in an individual metal cabinet which keeps flash and excess material out. This arrangement makes it possible to locate all these components close to floor level, in turn making possible location of the control panel within easy reach of operator.

Principal specifications for each press are as follows: die space, 35 in. left to right and 30 in. front to back; opening between platen and tophead, 44 in.; main ram stroke, 18 in.; operating pressure, 2640 psi; operating speed of 309 ipm for advance, 15 ipm for press, and 131 ipm for return. Provision is made for convenient and economical addition of a transfer unit if later desired.

American Steel Foundries, Elmes Engrg Div, 1150-A Tennessee Ave, Cincinnati 29, Ohio



Digital Read-Out Micrometer Introduced as Automatic Model

Carson-Dice Model HDR, said to be the first of its kind, incorporates an electronic circuit which responds to instant of contact between micrometer anvil and work before any pressure is built-up on the work by the micrometer screw. Motor drive automatically brings micrometer precisely to the point of contact at a speed far faster than can be done manually. Counter on instrument's front displays exact reading in ten thousandths of an inch. Five divisions between each digit on the unit wheel permit readings to 20 millionths of an inch.

Instrument has measuring range of 1 in. (⅞ in. with standard micrometer tip), and throat depth of 2 in. Upper head is adjustable in height to accommodate work up to 2 in. Standard anvil is readily removed for use of special fixtures. Repeatability is 0.00002 in. Operating knob at top of instrument permits rapid shifting of zero to any position within the 1-in. range in setting up the instrument; small knob on side of upper head facilitates setting counter to zero.

Unit is 11 in. high, 9 in. deep, 5½ in. wide. Power required is 18 w at 115 v ac. Automatic control system is incorporated in a single chassis; all connections to chassis are plug-in.

J W Dice Co, Englewood, NJ

Syracuse Automatic Stud Driver Offered in Smaller Version

Designed to meet demand for smaller version of 6- and 12-head automatic stud drivers previously announced, Model SD10-2 driver is easily adaptable to from 1 to 3 heads. Because heads can be spaced as close as 2½ in. center to center, they are easily integrated into automated index tables or conveyor lines.

Heads are individually driven by ½-hp motors—ac, dc, or air-torque—and are fitted with air-draulic or hydraulic connections. Units are equipped with JIC electrical cabinet, vibratory 4-track stud hopper, and either air-draulic or electric-hydraulic unit. Self-opening chucks grip and release studs without screwing out the driven studs.

Syracuse Special Machine Co, Inc, 2900 E Erie Blvd, Syracuse 3, NY

Piston seals for installation on aircraft fuel valves have been introduced as Permadized units. The rubber-to-metal bonding process makes seals available as one-piece parts, eliminating hand assembly and threading. Steel-smooth surface is said to assure perfect sealing even at near-zero pressure.

Stillman Rubber Co, 5811 Marilyn Ave, Culver City, Calif

ANNOUNCING!

Ross × Starline

Air Control Valves

Send For FREE FILE

of new valve data

A new valve series to help you solve thousands of design problems, use air more effectively, get the benefit of parts interchangeability! It's the ROSS Starline Series. Over 500 valve models. In-line or base mounted, solenoid or air activated. ¼" through 1¼" sizes. Both standard and JIC construction. Write for free data file!

Ross

A galaxy of new air-control stars are coming your way from

OPERATING VALVE CO.

122 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

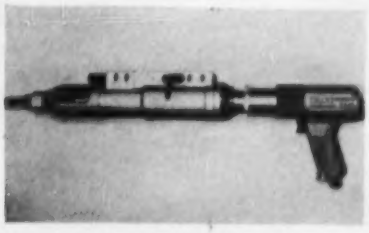
Model LB15A with AUTOPOSITIONER

Ram-Type Manipulator Improves Welding Operations

Designed for positioning and moving welding heads, automatic ram-type manipulator is controlled by electronic variable-speed drive which provides speed range of 5 to 100 ipm, or any desired 20:1 ratio. Dynamic braking stops ram instantly. Motorized double-chain lift, plus counterweight in column and brake motor, accomplish vertical movement of ram.

Special V-wheels guide lateral and vertical travel on SAE 4150 V-ways. Manual rotation of 360° is controlled from within heavy cast base. Carriage carries manipulator, power supply units, and flux-recovery equipment (if used). Leveling screws and lateral adjustment of track can be supplied as optional features. Several models are offered.

C B Herrick Mfg Corp, 2000 Center St, Cleveland 13, Ohio



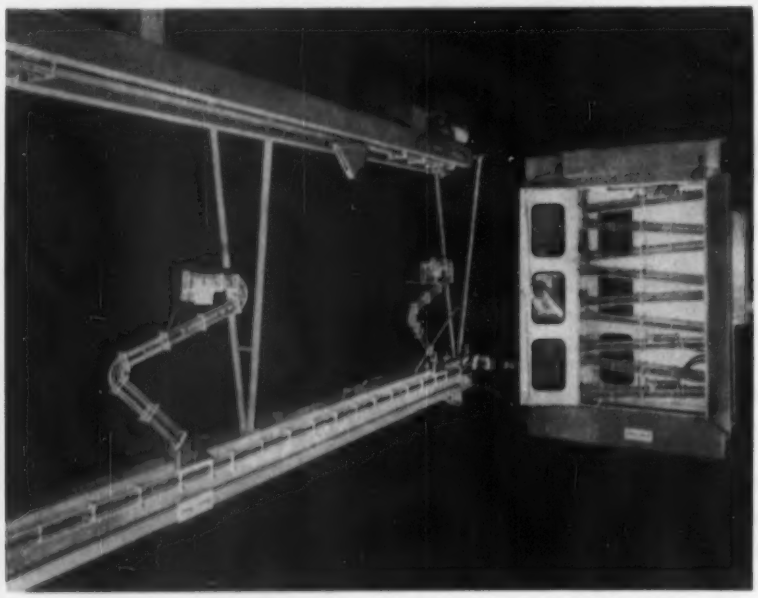
Keller Portable Drill Has Mechanical Feed Attachment

K-Matic drill hangs by its nose to a jig or fixture to absorb the thrust and torque of drilling up to ⅝-in. holes on hard materials. The portable air-powered tool develops up to 1000-lb thrust and is used for drilling in aluminum alloys, titanium, or heat-treated stainless and alloy steels.

Differential leadscrew prevents plunging on break-through, helps minimize work hardening. With standard bits and normal drilling conditions, tool reportedly will drill holes within 0.001 to 0.003 in. oversize, and uniform to ±0.0007 in. Drillbit automatically returns at the end of each stroke. Both feed and return strokes are controlled by a single lever.

The drill attachment is designed to fit company's 11A-2 and 11A-3 air drills, but can be used with any other make of portable drill if the attachment adapter is machined to fit the drill. Attachment weighs less than 5 lb, is less than 12 in. long, and has a stroke length of 1¼ in. Chuck capacity is ⅜ in., and feed ratios are 0.002 or 0.003 ipr. Complete line of drill-bushing tips for quick mounting of the attachment to a jig or fixture is offered.

Keller Tool Div, Gardner-Denver Co, Grand Haven, Mich



DEMAND-FEED DISTRIBUTION SYSTEM can provide automatic production without synchronization of and without altering standard machine tools. Progress of parts through line can be in series or parallel; each machine tool is supplied at its own demand rate. Design introduces "elastic" floats into system wherever necessary; these floats maintain an even flow of parts through the line, absorbing differences in productive capacities between machine operations. Controls are independent of machine controls—*Cargill Detroit Corp, 2254 Cole Ave, Birmingham, Mich*

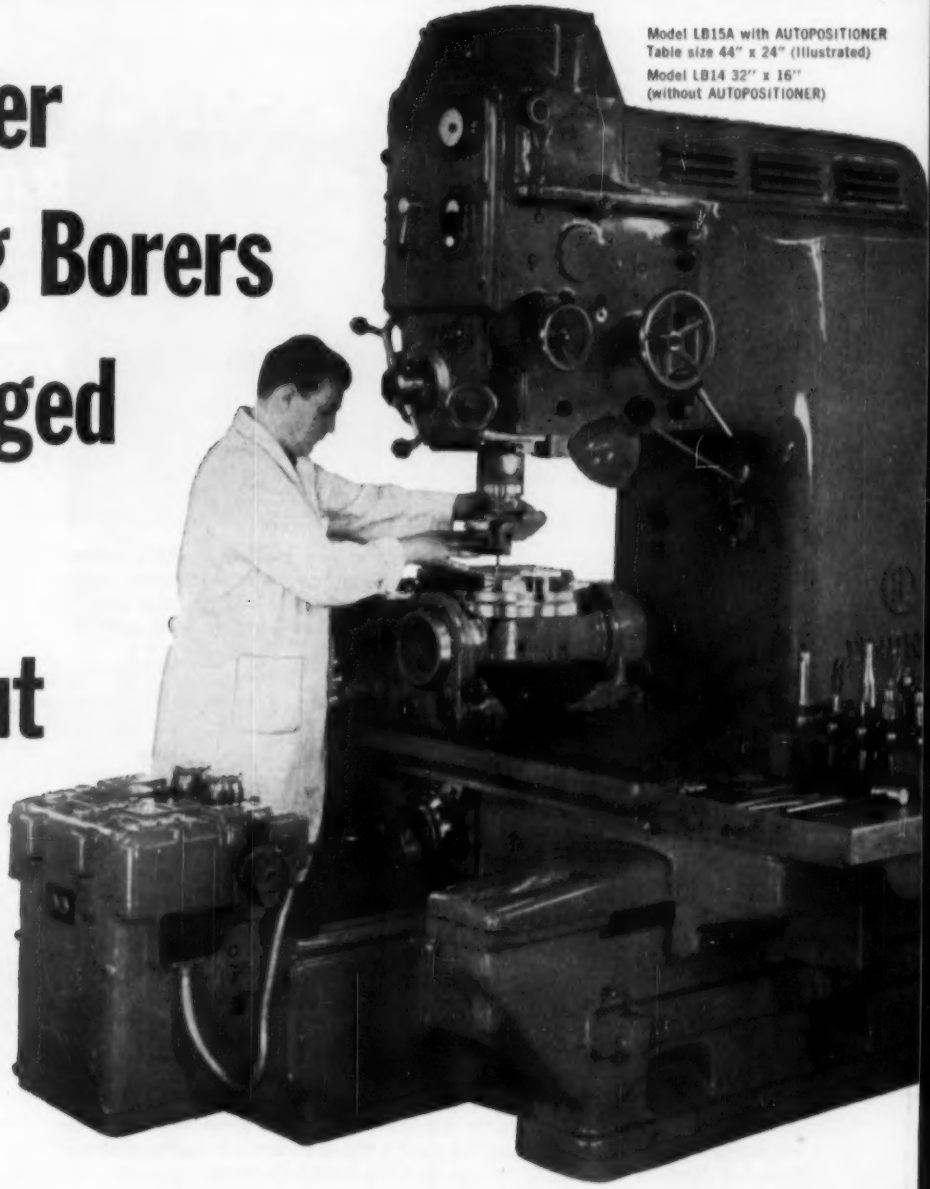
Hydraulic Rescue Equipment Comes in Kit Form

Complete line of hydraulic equipment known as Porto-Power Rescue Equipment is designed to help carry out a variety of rescue operations in the event of industrial disaster. Equipment comes in kits that include a hand-operated pump and a ram, which are joined by a flexible hose to permit remote control of the ram. Kits also contain attachments which thread onto the ram to harness it for lifting, pushing, pulling, spreading, clamping, and pressing.

Four basic kits are offered, in 4, 10, and 20-ton "power packages." Company also offers other hydraulic tools, up to 100 tons, for rescue operations. Each type is designed for a specific range of rescue work. None require an outside source of power. Catalog HR300.

Blackhawk Mfg Co, 5325 W Rogers St, Milwaukee 46, Wis

why Lindner Optical Jig Borers have changed so many ideas about jig boring



Model LB15A with AUTOPOSITIONER
Table size 44" x 24" (Illustrated)
Model LB14 32" x 16"
(without AUTOPOSITIONER)

Optical measuring system does not depend on lead screws, gage blocks, bars or limit switches—is permanently protected against mechanical wear. Only a light beam touches helically scribed cylindrical measuring scales which are independent of table movement mechanism and are *immovable* in axial direction.

AUTOPOSITIONER® enables operator to preselect table position for next hole while one boring operation is in progress—eliminates non-productive time between holes. As one hole is completed, table moves in rapid traverse to the next preselected position.

Photo-electric optical centering device minimizes visual fatigue and errors in settings—permits initial and repeat settings guaranteed accurate within .00015" and readings in .00005".

Projection screen eliminates operator eye strain and bending—helical line from measuring scale is projected on 2½" x ¾" screen which operator reads in standing position without eyepiece.

Automatic table clamping prevents errors in clamping and unclamping table between movements.

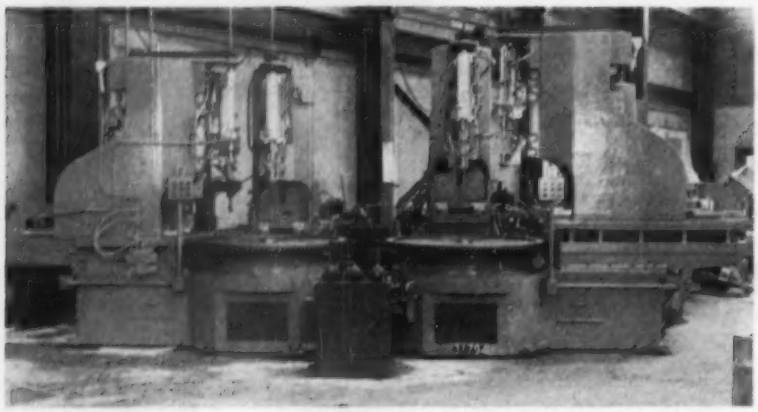
● ***Send for 25-minute movie film demonstration***

KO CO., INC. INDUSTRIAL IMPORTERS

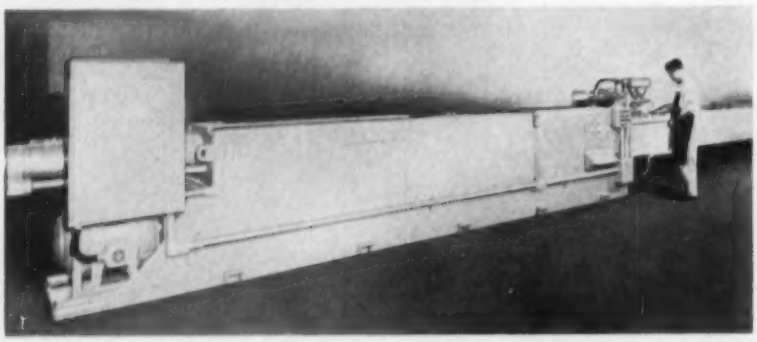
KURT ORBAN COMPANY, INC.

36 Exchange Place, Jersey City 2, N. J. • In Canada: 2490 Eglinton Ave. W, Toronto

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



JET-ENGINE COMPONENTS are drilled on two-way machines, which feature company's Electrodex index tables to permit programming for different workpieces. The large standard-way columns move the drill units in and out for different bolt circles of work. Each machine employs variable feed, with six spindle speeds—*Avey Drilling Machine Co, Cincinnati 1, Ohio*



CARRIAGE-RAIL ASSEMBLIES for business machines are cut on Model HAS-15 horizontal hydraulic broaching machine, which has a stroke of 10 ft and is over 36 ft long, including the chip trough. Unit cuts opposed 0.085-in.-deep V-grooves in the assemblies. All sizes are broached on the same machine—from longest to shortest (down to 11-in. cut)—using the same broach inserts—*Colonial Broach & Machine Co, Box 37, Harper Station, Detroit 13, Mich*

Detrex Processing Unit Handles Bulk Parts Automatically

Designed for the automatic handling of bulk parts, processing unit can incorporate such stages as washing, rinsing, pickling, phosphate coating, application of lubricants, and drying. Drums are stationary, and work being processed is in constant motion. Parts are oriented for drainage as they transfer from drum to drum.

Company offers great flexibility of design with regard to time cycles; short immersion cycles and rapid transfer time can be incorporated. Production capacity can vary widely also. Unit can accommodate all types of automatic loading and unloading devices.

Detrex Chemical Industries, Inc, Detroit, Mich

Electric Motor Operates Without Bearings or Lubrication

Air-Glide Engineering Laboratories has developed a new motor that is said to require neither bearings nor lubrication, even when new.

Rotating assembly is supported within the stator on a film of fluid which may be a gas or liquid. Load-supporting film of fluid acts in the gap region. Motor alignment problems, end bell housings, bolts, wicks, conventional bearings and grease are reportedly eliminated; motor is "lubricated" by the fluid which surrounds it. If the motor is in a room, the air in the room acts as fluid-supporting film; if it is submerged in a tank of gasoline, the gasoline acts similarly.

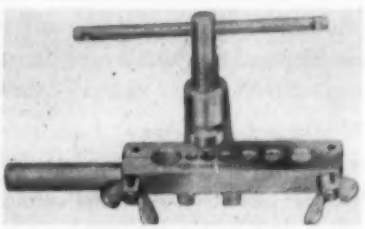
Air-Glide Engineering Laboratories, Vermilion, Ohio

Whitney Hydraulic Punch Offered in 12½-Ton Model

No. 95 hydraulic punch, with rated capacity of 12½ tons, can punch a ⅝-in. hole through ¼-in. iron, or a 2-in. hole through ⅛-in. iron. Punches may be obtained in round, square, oval, rectangular, and special shapes.

Punch has a 10-in. depth of throat, is offered with a 1½-hp motor either in 110-220-v single-phase or 220-440-v triple-phase. Operator works from front of tool, which is operated by a foot treadle. Basic model is available in bench form (illustrated), or furnished with cabinet.

Whitney Mfg Co, 636 Race St, Rockford, Ill



FLARING TOOL designed for work on copper tubing is constructed in two parts to facilitate carrying. Assembly for operation is done in seconds, and a single flare can be made on seven tubing sizes between 3/16 and ⅝ in. Lock-in holes accommodate these sizes without crushing—*Nye Tool Co, 4120 Fullerton Ave, Chicago 39, Ill*

NOW! V-R Carbide Inserts

in the New Engineered Plastic Package...

. . . That meets industry's need for easier inspection and use, quicker identification, easier storing and better carbide protection.

Saves space—saves time—Inserts are visible through package for quick inventory.

Slide it open . . . remove insert . . . slide it closed. It's the new engineered transparent plastic package for V-R throw-away carbide inserts. Here are the advantages:

Easy To Remove Inserts For Inspection Or Use—no fumbling—no dropping—and the insert goes right back into the partitioned container.

Easy To Take Inventory—just turn the package over and look through the transparent bottom.

Instant Identification—insert style, carbide grade and quantity are clearly stamped on package label. Carbide grade is designated on each insert and visible through package.

Maximum Carbide Protection—chances of dropping, chipping or breaking carbide are reduced to an absolute minimum. Package is rigid and durable. Inserts never touch each other.

Easy To Store—takes less drawer or shelf space and is easier to store and handle than any insert package ever before devised.

A complete line of standard throw-away inserts . . . triangular, round and square—all packaged in V-R's exclusive new transparent plastic containers.

Here is the convenient, time and money-saving package for the finest quality carbide inserts you can buy. Order your V-R inserts today. Call your local V-R Representative or Distributor, or write:

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

806 Market Street • Waukegan, Illinois

MANUFACTURERS OF CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

C-596

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

Single-Point Threading Tool Operates in Reversing Lathe

Spee-D-Thred is designation for threading tool, made by Warner Development Co of Beloit, Wis, designed for single-point threading on a reversible engine or turret lathe. Toolbit is secured in a head that rides on a cone point in the main tool body and is backed by a ball joint at the rear. Cone extends down through the body to a stud on which a cylindrical collar is threaded and adjusted to required height to support the point during the forward cutting stroke.

Reversing the lathe causes the cutting point and upper anvil to raise slightly to take care of backlash. This movement also permits the toolbit to turn to the helical angle of the thread and follow the thread back to the starting position without dragging. At this point the upper anvil drops back into engagement and is ready for the next cutting cycle, because the leadscrew and split nut have at no time been disengaged.

Illustration shows upper anvil raised slightly on return stroke. Micro switches can be set to limit forward and reverse travel of lathe carriage, making operation fully automatic.

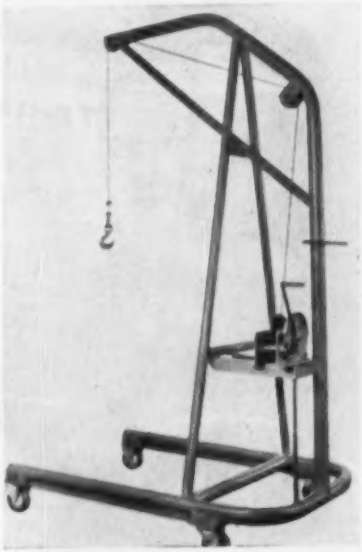
Distributed by Easco Products, PO Box 587, Ypsilanti, Mich

New Aluminum Oxide Coatings For Use in Flame Plating Parts

Aluminum oxide applied by flame-plating is said to provide excellent coating on parts subject to erosion and corrosion at high temperatures.

Coating has hardness of 1000 to 1200 vpn (300 gram load) and less than 1% porosity. It can be applied in thicknesses from 0.001 to 0.040 in. to all common engineering metals. Common acid and salt solutions, oxidizing and reducing atmospheres, and many low-temp molten metals reportedly do not affect it. Product does not begin to deteriorate below 1200 F, and in some cases, not below 1800 F, according to manufacturer. It can be left at the as-coated roughness (125 to 150 mu-in. rms) or finished to 1 mu-in. rms.

Linde Air Products Co, Division of Union Carbide & Carbon Corp, 30 E 42nd St, New York 17, NY

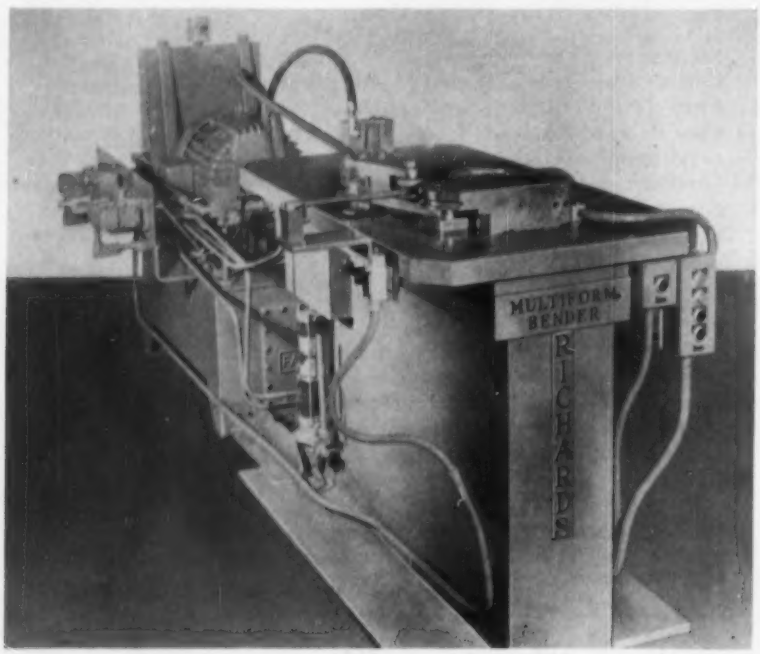


350-lb Portable Crane Carries 3000-lb Load

Lightweight, all-purpose unit will carry a 3000-lb load on a single line with only one man at the crank. It can be tilted back like a two-wheel truck and wheeled through low overhead doorways.

Features include Safety Spur gear winch which operates with very low friction, requires only seven turns of the crank to gain complete drum revolution. Seven turns of the Safety winch crank lift the load approximately one foot; load is held securely in position whenever the operator stops turning. Model 1-C has overall height of 7 ft 6 in.; Model 2-C, 9 ft.

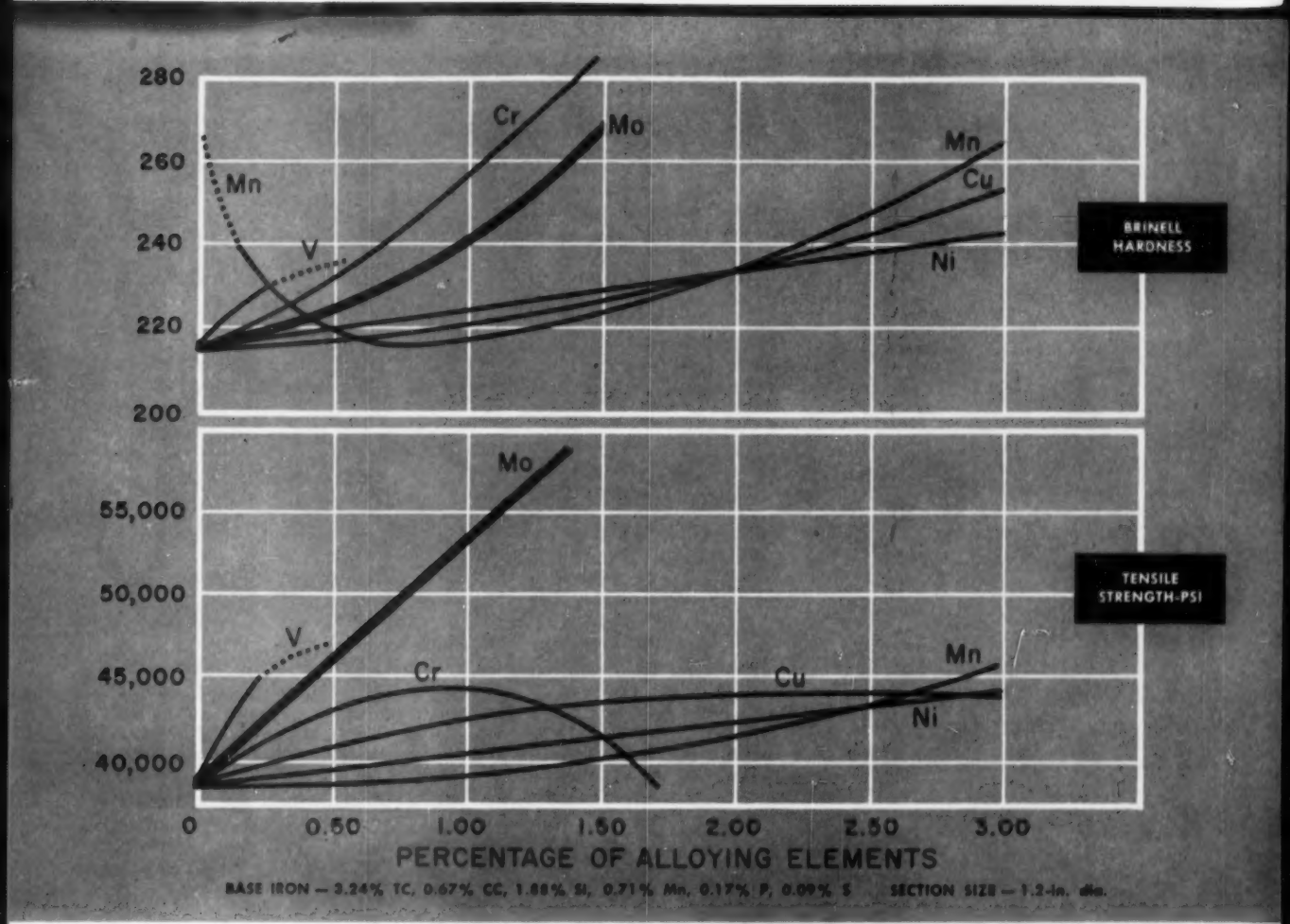
Sasgen Derrick Co, 3101 W Grand Ave, Chicago 22, Ill



TUBULAR CHAIR BACK SUPPORTS in various sizes are produced on multiform "Big Brother" hydraulic bending machine, Model BB-CS. Operated by a 15-hp motor, machine has standard ram stroke of 4 in., auxiliary-cylinder sweep stroke of 18 in., and a shut distance between heads adjustable from 6 to 8 in. Unit can be equipped for such operations as bus-bar forming, metal fabricating, stamping, blanking, staking, and piercing—*J A Richards Co, Kalamazoo, Mich*

Vibration mount for machinery, called Lev-Elasto Damper, is available in 9 sizes for loads ranging from 65 to 12,000 lb per unit. Internal leveling adjustment permits installation anywhere under the machine. Felt pad on top plate is provided; mounting can be cemented to machine or bolted through a tapped hole provided, if necessary.

Korfund Co, Inc, 48-39-B 32nd Pl, Long Island City 1, NY



Note how additions of moly, up to 1.5%, produce proportional improvements in strength. And, with moly, hardness increases much more slowly. It means higher strengths can be used with less danger of impaired machinability.

each ½% Moly adds 7000 psi to strength of cast iron...

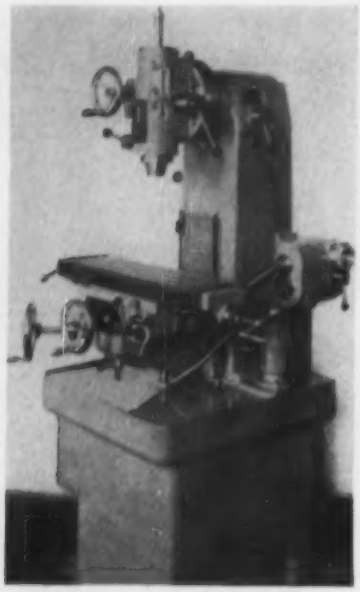
A little moly adds a lot of strength — for molybdenum increases strength more than any other common alloying element, with the exception of small vanadium additions. A rule of thumb is that fifty points of moly raise tensile strength 7000 psi. And without sacrificing toughness. Actually, moly improves toughness at least as much as strength.

What's more, versatile moly aids in obtaining uniform response to heat treatment . . . and in producing machinable, growth-resistant castings. Moly is easy to use, too. With most grades of cast iron, moly requires no change in the character of the charge, normal melting practice, or the base metal. And foundrymen like the fact that the small additions necessary may be made at the spout or in the ladle.

Write now for "Why Moly Iron". It's the full story of how and why moly adds strength faster than hardness, how it increases fatigue and torsional strength—in short why moly makes better cast iron. Climax Molybdenum Co., Department 12, New York 36, N. Y.

CLIMAX MOLYBDENUM

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



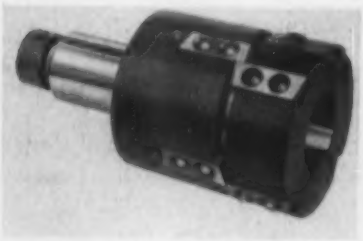
Vertical Milling Machine Has Automatic Longitudinal Traverse

Imperial Model M-1 vertical milling machine, a product of Italy, features sturdy design, heavily ribbed frame, and head said to be practically free of noise and vibrations. Main spindle and transmission gears are of high-grade hardened steels.

Vertical head swings up to 90° in each direction. Six automatic feeds are provided, ranging from 0.47 to 9.85 ipm. Adjustable stops disengage the automatic movement instantaneously.

Milling spindle drive is from 1½-hp 2-speed motor. Spindle is adjustable and its movement is limited by a stop. Accessories offered include single and multiple indexing heads—horizontal, vertical, and universal—with instantaneous coupling.

Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY



Releasing-Type Tapholder

Designed for multiple - spindle screw-machine operations, releasing type tapholder is offered in a version which features simplified construction, minimizing wear and maintenance. Unit illustrated has a 1½ in. hole and shank, and includes a 1½-in. bushing. The same model is also available in a 2⅝-in. shank. Other sizes are available in standard or special shanks.

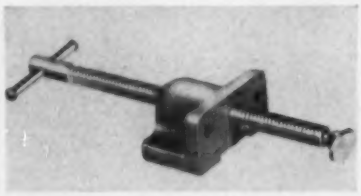
Tool can be changed quickly and simply for righthand or lefthand tapping. It automatically disengages at a pre-determined tap depth to hold consistent tolerances on tapping operations. Positive reversing mechanism eliminates binding to reduce tap breakage.

Trico Coolant System Operates from Shop Air Line

Trico-Mist coolant system is a self-contained unit available with one and five-gallon containers, single or multiple outlets. Container is filled with soluble wax or coolant and shop air-line hose (25 to 50 psi) is attached. A simple needle valve controls size and volume of mist spray and provides shut-off.

No air pressure is in the container at any time. Container is of heavy-gage steel with baked enamel interior to resist rust and corrosion. Bulletin 37.

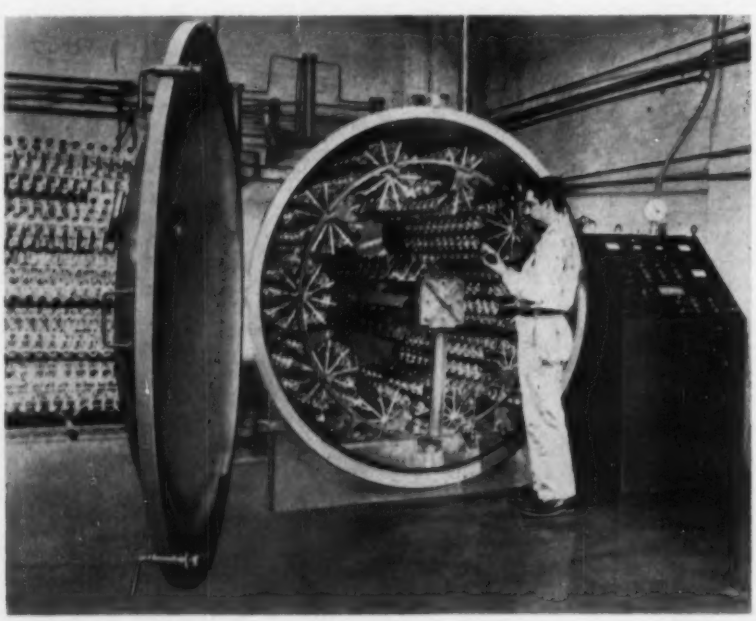
Trico Fuse Mfg Co, 2948 N 5th St, Milwaukee 12, Wis



FIXTURE LOCK called Rapid Titan provides automatic clamping and release. Front and bottom of body are machined flat, and mounting holes are provided in both faces. Screw is cadmium plated and has a travel of 6¼ in.—*Wilton Tool Mfg Co, Inc, Schiller Park, Ill*

New cadmium plating products include Super XL Cadmium Brightener, an addition agent said to produce exceptionally bright plate; Cad-Sol, a pure, concentrated solution of cadmium cyanide for make-up or maintenance of baths; Cadip, for addition to final hot water rinse to speed drying and prevent discoloration; Rodip CD-3 and CD-4, single, short-dip chromate post-plating treatments for corrosion protection.

R O Hull & Co, 1306 Parsons Court, Rocky River 16, Ohio



PLASTIC REFLECTORS FOR CAMERA FLASHGUNS are vacuum-plated in 72-in. vacuum metallizing chamber at the rate of 1100 every 10 min. Plating is a thin, glossy layer of aluminum which requires no further polishing or buffing. Special air-drying lacquers are applied as an undercoat before metallizing and as a protective topcoat after finishing. Chamber is installed in Maspeth, N Y plant of Premier Vacuum Process Corp—*F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Penna*

CLIMAX MOLYBDENUM

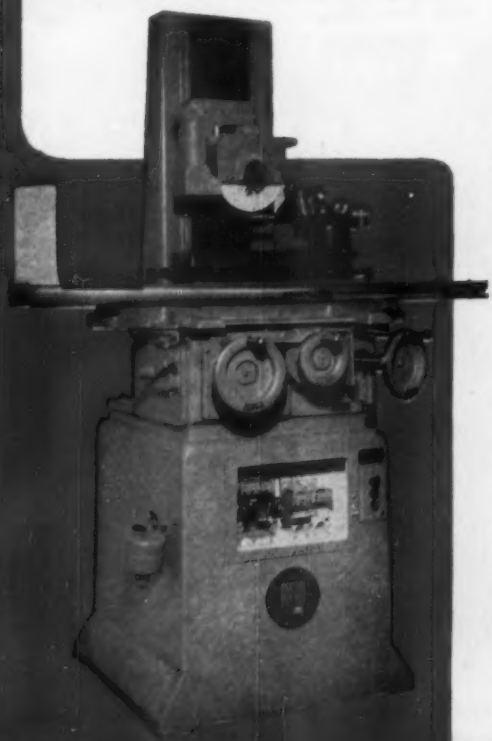
Molybdenum is the key for better casting:

- Wear resistance
- Machinability
- Economy
- Response to heat treatment

PRECISION REID SURFACE GRINDERS

SETS THE STANDARD *for Precision* SURFACE GRINDERS

MODEL 824 Reid-O-Matic with push-button controls for fast selection of all grinding operations and quicker set-up and changes. Outstanding features, for production and toolroom grinding, include: finger-tip level controls, electrical components in single, sealed base housing for easy access, and adjustable gibs on head ways.



Specifications:
Capacity — 8″wide, 24″ long, 15″ high
Worktable — 66″ by 10¼″ overall
Table speed — infinite variation, 0 to 75 fpm.
Feed range — elevating mechanism, to .0005″; vernier, to .0001″
Spindle — 2 H.P., 1800 rpm. (std. cartridge type)

MODEL 618 — the standard for truly precise toolroom grinding. Features include: rugged construction with one-piece column, cogged timing belt for smooth table operation and sealed cartridge type motorized spindle for smooth chatter-free operation.

Specifications:
Capacity — 6″ wide, 18″ long, 17¼″ high
Worktable — 51″ by 8″ overall
Table speed — infinite variation, 12 to 35 fpm.
Feed range — elevating hand wheel-to .0005″; cross feed — to .001″
Spindle — 1 H.P., 3450 rpm.

For full details and specifications write for Bulletin 800

Reid Brothers Company, Inc.

BEVERLY MASSACHUSETTS

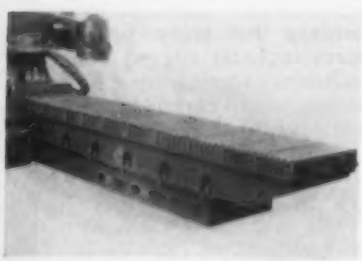
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

Lightweight Periscope Inspects Internal Walls of Fuel Tanks

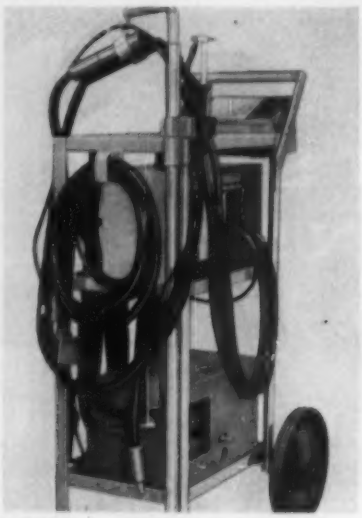
Inspection periscope for aircraft and other fuel tanks is 30 in. long, has viewing head diameter of 2⅜ in. up to the point where it is inserted into the tank. Zirconium arc lamp, outside the tank, casts strong beam of light by means of separate optical system; field of vision is illuminated intensely enough to scrutinize seams and imperfections of the black rubber lining.

Scanning prism operated by viewing control button allows operator to tilt field of instrument from straight forward to a position at right angle to instrument axis. This, plus rotation of instrument in opening, permits inspection of any inside point of tank, including wall through which periscope is inserted. Unit weighs 15 lb; power supply and 30-ft cable weigh an additional 25 lb.

Testa Manufacturing Co, 10130 E Rush St, El Monte, Calif



CUSTOM-MADE WAY GUARDS are made to expand and compress with the movement of any machine, regardless of horizontal, vertical, or angular positioning. All the folds expand equally and simultaneously, insuring long life and full protection of ways—*Can-Pro Corp, Dept AM, Fond du Lac, Wis*



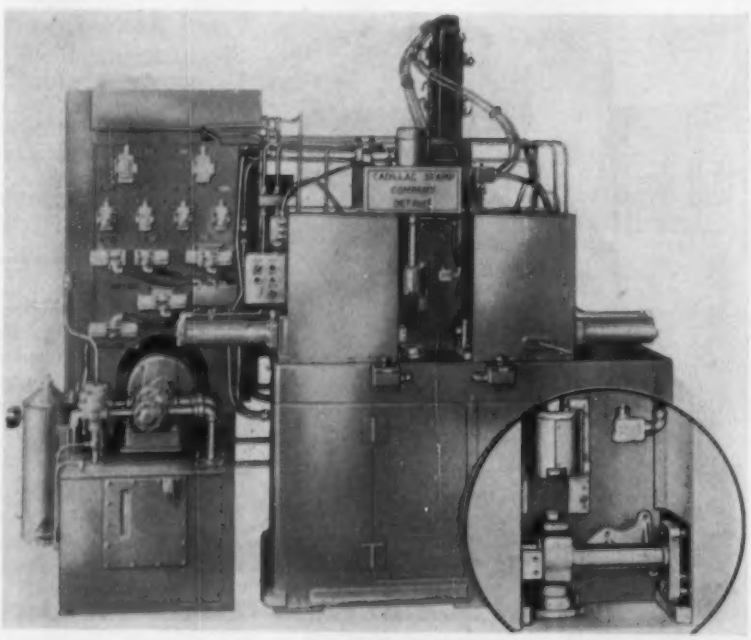
Portable Welding Equipment For Aircraft Applications

Model R-500 portable welder, equipped with double pole and single pole electrode guns, is designed for repair and production of stainless steel fiberglass insulating blankets and shrouds in thicknesses from 0.002 to 0.020.

Double pole gun permits two simultaneous welds to be made in one operation. Small, single pole, for use where space is limited, is used with a separate ground and produces one weld. Unit operates with 115 or 230-v ac single-phase 50-60-c power supply and is equipped with specially designed welding transformer. Structural steel cart is 10 in. wide, 36 in. high, 20 in. long.

Joyal Products, Inc, 115 Edison Pl, Newark 5, NJ

NON-CORROSIVE BINS are available in stainless steel, galvanized steel, or aluminum. Bins are available in many sizes; most common is 48 in. long, 36 in. wide, and 24 in. deep. Unit is equipped with roller-bearing 12-in.-dia center wheels and 8-in.-dia rigid end wheels. Both trailer and caster steering are offered—*Lewis-Shepard Products, Inc, Dept R-30, Watertown, Mass*



STEERING-GEAR HOUSING PARTS are assembled on special assembly machine, which performs the following cycle in 10 sec: hopper-feed and press in place one welch plug and two bushings, press in place one ball race, and burnish and inspect ID of two bushings—*Cadillac Stamp Co, 17315 Ryan Rd, Detroit 12, Mich*

BEVERLY MASSACHUSETTS

SIP

Guaranteed Accuracy

More and more manufacturers apply SIP *Guaranteed* Accuracy to define, establish and maintain high precision in production and measurement to improve quality-of-output and economy-of-operation.

NORTHERN ORDNANCE INCORPORATED

TEMCO AIRCRAFT CORPORATION

American Optical

Rheem AVIATION PLANT

National

Avey

SPERRY

IBM

CANADAIR — AIRCRAFT MANUFACTURERS —

Thompson Products, Inc.

MOTCH & MERRYWEATHER

Ford

LOCKHEED

Hamilton Watches

RENDA ENGINES

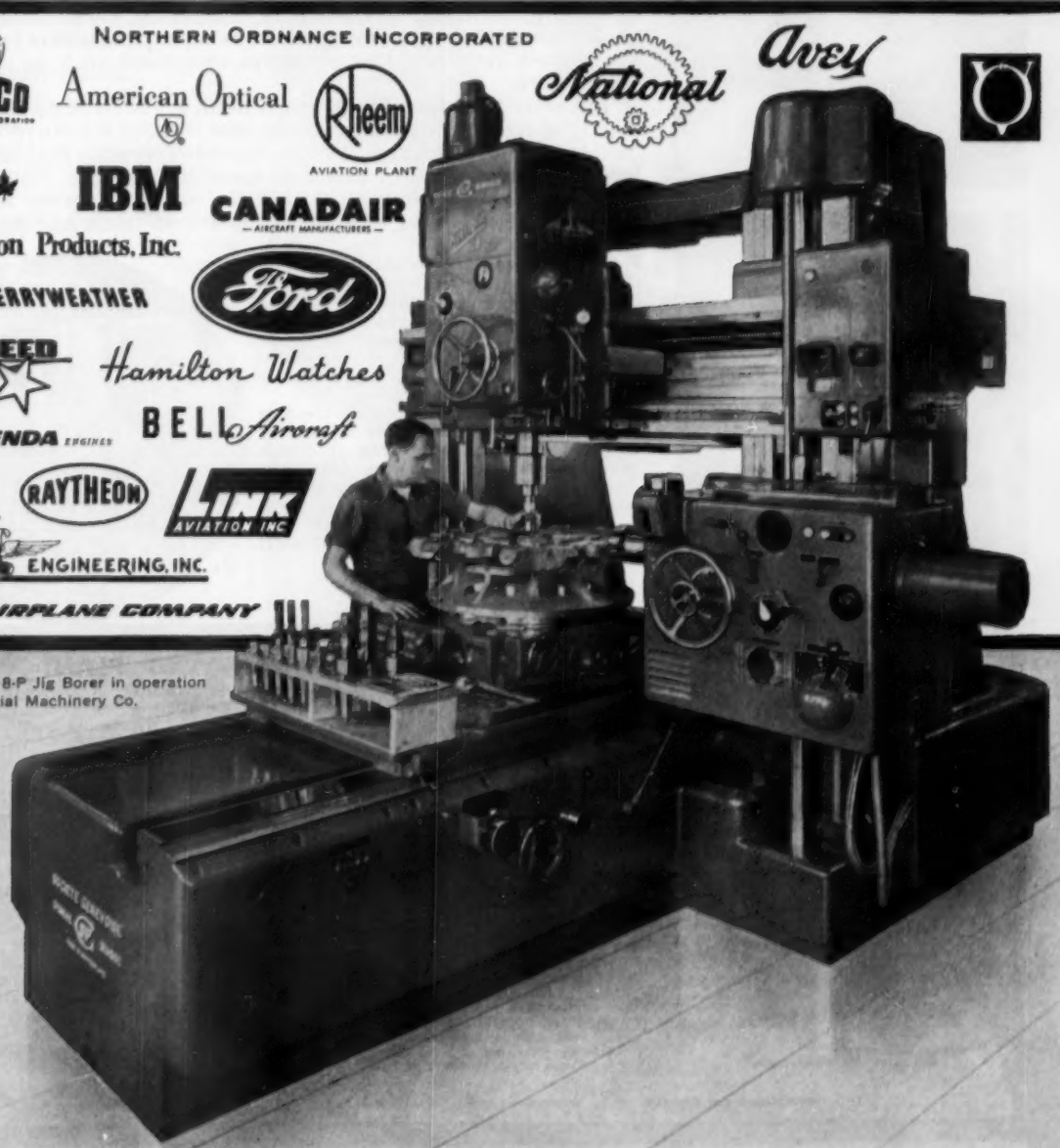
BELL Aircraft

RAYTHEON

LINK AVIATION INC

Merz ENGINEERING, INC.

BOEING AIRPLANE COMPANY

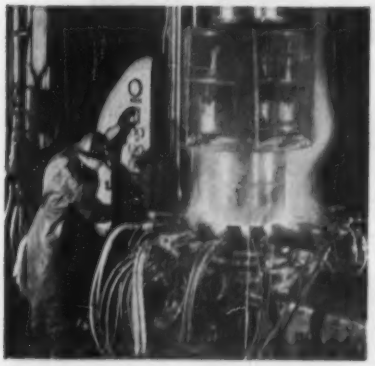


SIP HYDROPTIC 8-P Jig Borer in operation at Hartford Special Machinery Co.

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS & MEASURING EQUIPMENT

100 EAST 42nd STREET, NEW YORK 17, N. Y.



You need MORE than these to Heat Treat Metals!

The science of heat treating has become of vital importance to many manufacturing operations. Without the radical improvements of the properties and characteristics achieved in metals and alloys by heat treating, many of the nation's most important products could not be made.

To perform the appropriate type of heat treatment, such as annealing, normalizing, quenching, tempering, carburizing, controlled atmosphere hardening, stress relieving and others requires specialized, intricate, and expensive equipment such as is illustrated here.

But *more* than such equipment is needed. The most modern and highly specialized equipment is useless without the correct combination of operational skill and technical experience that has been developed over years of practical operating practice. Equipment and materials are important, but the *essential* factor in heat treating operations of all kinds is the human touch and the practiced hand.

The members of the Metal Treating Institute listed here are the recognized leaders of the commercial heat treating industry. They are specialists possessing the equipment, the technical skill, the years of experience, and the personnel with which to solve your heat treating problems all under one roof.

When you need complete heat treating services or want consultation concerning heat treating or engineering or design problems, write any of the companies listed. All inquiries will receive prompt attention.

WRITE FOR A COPY OF A BOOKLET "A REVIEW OF SALT BATH CARBURIZING".

THERE'S A HEAT TREATING SPECIALIST NEAR YOUR PLANT

Allied Metal Treating Corporation
Kenosha, Manitowoc, Pt. Washington, Racine, Wisc.

American Metal Treatment Co.
Elizabeth, New Jersey

Anderson Steel Treating Co.
Detroit, Michigan

B. & W. Precision Heat Treating Co.
Kitchener, Ontario, Canada

Benedict-Miller, Inc.
Lyndhurst, New Jersey

Bennett Heat Treating Co., Inc.
Newark 3, New Jersey

Commercial Metal Treating, Inc.
Bridgeport, Conn.

Cook Heat Treating Co. of Texas
Houston 11, Texas

The Dayton Forging & Heat Treating Co.
Dayton 3, Ohio

Domisy Heat Treating Corp.
Dallas, Texas

Drever Company
Philadelphia 33, Pennsylvania

MTI MASTER CRAFTSMEN METAL TREATING INSTITUTE

Greenman Steel Treating Company
Worcester 5, Massachusetts

Fred Heinzelman & Sons
New York 12, New York

Alfred Heller Heat Treating Co.
New York 38, New York

Hollywood Heat Treating Co.
Los Angeles 38, California

L-R Heat Treating Company
Newark, New Jersey

The Lakeside Steel Improvement Co.
Cleveland 14, Ohio

Metallurgical, Inc.
Minneapolis 14, Minnesota

Metallurgical, Inc.
Kansas City 8, Missouri

Metlab Company
Philadelphia 18, Pennsylvania

New England Metallurgical Corp.
South Boston 27, Massachusetts

Paulo Products Company
St. Louis 10, Missouri

Pittsburgh Commercial Heat Treating Co.
Pittsburgh 1, Pennsylvania

The Queen City Steel Treating Co.
Cincinnati 25, Ohio

J. W. Rex Company
Lansdale, Pennsylvania

Stanley P. Rockwell Company
Hartford 12, Connecticut

C. U. Scott & Son, Inc.
(Stainless Steels)
Rock Island, Illinois

Standard Steel Treating Co.
Detroit 10, Michigan

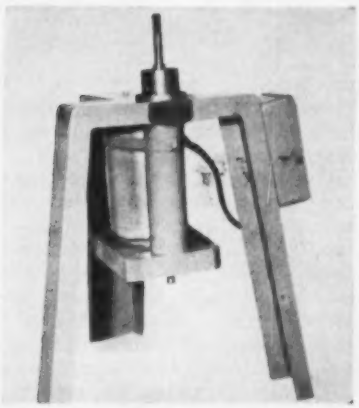
Syracuse Heat Treating Corp.
Syracuse, New York

Wisten Heat Treating Company
Cleveland 14, Ohio

This advertisement sponsored by these Companies which are members of the Metal Treating Institute.

METAL TREATING INSTITUTE

271 NORTH AVENUE
NEW ROCHELLE, NEW YORK

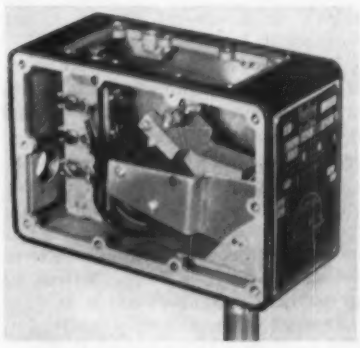


Lowcost Profile Router Has 10,000-rpm Spindle

Model 55-P incorporating the Wallace 10,000-rpm "Speed Spindle" has a heavy steel stand for maximum freedom of action. Heavy-duty machine, priced under $500, was originally developed to provide fast, flexible means of trimming aluminum alloy formings to exact finished shape, regardless of contour.

Work is clamped to plastic templet which rests against a ball bearing collar on spindle. Lower support contacts work to maintain proper height. By holding light pressure against collar, operator performs trimming operations free-hand, tilting work as required to keep cutter perpendicular to contour. Plastic templets which may also be used as drill jigs are the only tooling necessary; same cutter setup handles all jobs.

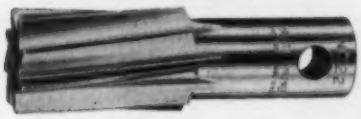
J D Wallace & Co, 1009 N Detroit St, Warsaw, Ind



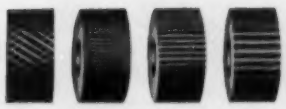
Differential Expansion-Type Temperature Controllers

Applications of Models F-1C, F-2C, and F-3C include accurate on-off temperature control of heating op-

REAMERS



TAPS



KNURLS

THREAD ROLLING DIES

CUT-OFF BLADES

Screw Machine Cutting Tools

for the long run . . .
because they run longer!

MONOCONE DIES AND HOLDERS

DUOCONE DIES AND HOLDERS

Next time you buy Screw Machine Cutting Tools, remember it's not the purchase price but what you get for your money that counts most . . . how many pieces each tool delivers on the production line!

In correct design and high quality, P&W Screw Machine Cutting Tools rate as the best buy anywhere. And you can select the tools you need — when you need them — from comprehensive warehouse stocks carried *on the shelves* at the Pratt & Whitney Branch Office conveniently near you.

FOR COMPLETE INFORMATION, WRITE TODAY FOR FREE CUTTING TOOL LITERATURE.

PRATT & WHITNEY COMPANY
INCORPORATED

11 Charter Oak Boulevard, West Hartford 1, Connecticut
Branch Offices and Stocks in Principal Cities

MACHINE TOOLS • GAGES • CUTTING TOOLS

This exact measurement stick, made of enduring Black Granite is the Master Gage. With this Royal Cubit length, you test the truth of all working Cubit Sticks every Moon Cycle.

How the King's Arm Made the Pyramids Exact

The Egyptians started it more than 5,000 years ago when they established the first standard of measurement known as the "Cubit Stick". It was the exact length of the Egyptian ruler's arm from elbow to fingertip. This official length was preserved on a Royal "Master Cubit Stick" made from a shaft of black granite (even today the most stable and endurable of all granites). The accuracy maintained by the builders of the superb obelisks, pyramids and temples was accomplished by regularly checking their working "Cubit Sticks" against the "Master Cubit Stick".

This is the original concept of today's gage block as a master reference gage for inspection and for checking all other measuring instruments.

The backbone for industrial use of the standard unit of measurement today is steel gage blocks used in conjunction with black granite surface plates accurate to millionths of an inch. All other measuring instruments such as micrometers are calibrated and regularly checked against these gages in order to maintain their accuracy.

With our refined measurement tools American industry can make millions of duplicate parts in many different plants, all interchangeable with each other. Net result is our mass production economy that gives us an abundance of high quality moderately priced goods and gadgets.

The Egyptians combined slave labor with meager tools and produced great plenty for the rich and mighty. We combine free labor with abundant tools and produce great plenty for all.

Produced by DoALL are black granite gaging instruments, gage blocks, and a wide range of accessories, including micrometers, comparators, monolights for product inspection as shown below. Textbooks and free instruction in the "Science of Precision Measurement" are available from DoALL.

Reprints available for your employees.

The DoALL Company offers industry over 1500 machine tool, cutting tool, gaging and supply items through a nationwide network of 38 local Sales-Service Stores. Call DoALL, or write:

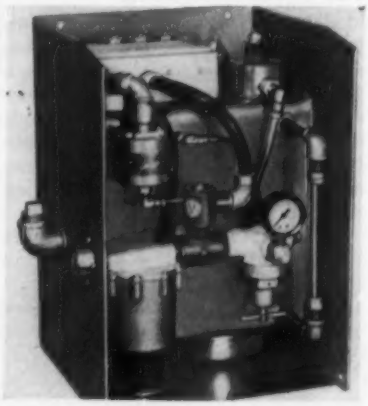
The DoALL Company

Des Plaines, Illinois E-54

erations, processes, equipment; safety alarms and cut-outs on similar installations; and combinations of control and alarm.

Choice of one, two, or three snap-action switches on any instrument makes possible many unusual installations, according to manufacturer. Temperatures from sub-zero to 2000 F can reportedly be handled; adjustable ranges as wide as 1200 F in one instrument are offered. Standard switch rating is 15 amp, 125-250 v ac; higher ratings are available.

Burling Instrument Co, 16 River Rd, Chatham, NJ



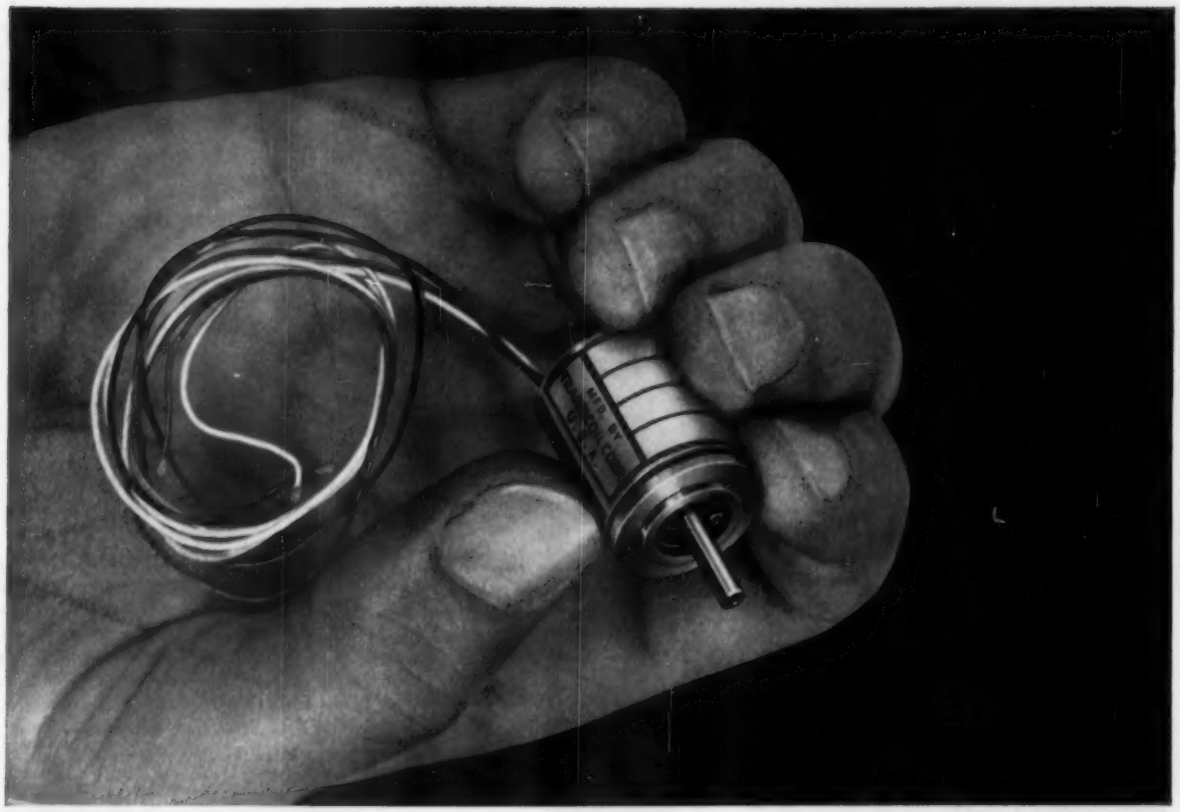
New Oil Mist Lubricators Consume Minimum of Oil

Two new Alemite Oil-Mist units designed to provide continuous lubrication for up to 300 or 500 bearing inches (one bearing inch equals one inch of shaft diameter) of mechanisms are said to consume only 1/10th as much oil as any other method of lubrication.

Lubricators are designed to operate either in a compact installation or extended over a distance of 400 ft, with automatic control of all operating conditions. Built-in safety switches provide instant response. Oil-Mist is operated automatically from the machine's on-off switch, has no moving parts; constant, uniform volume of fresh oil film is picked up by each bearing as it needs it.

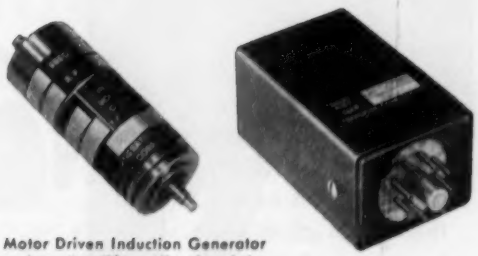
Stewart-Warner Corp, Alemite Div, 1826 Diversey Pkwy, Chicago 14, Ill

Retractable die stop, called Keystone, is a stop pin for compound dies, and is reported suitable for stripper plates, draw rings, oil breakers, and similar uses. Four body sizes are available, ranging from ½ to ¼-in. diameter. Body is cadmium



NEW MINIATURE SERVO

40% Lighter, 10% Smaller



Size 8 Motor Driven Induction Generator and Transistor Amplifier. All units of the Size 8 system have been designed for maximum performance in minimum space.

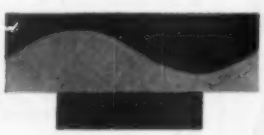
Here, no bigger than your thumb, is the smallest *practical* servo control motor currently produced. Combined with Transicoil's new Size 8 motor driven induction generator, and powered by a new completely-transistorized servo amplifier, this motor offers you the unusually high torque-to-inertia ratio of 28,000 radians/sec^2.

Compared with a Size 9 control motor—until now, the smallest practical unit available—Transicoil's new Size 8 measures only 0.75 inches in diameter, 10% smaller, and weighs only 1.4 oz., 40% lighter. Yet it operates on standard voltages from 26 to 52 volts, and 52 volts with center tap, at 400 cps, permitting push-pull transistor application.

Hence, just as Transicoil's introduction of plate to plate wiring eliminated the transformer, once necessary in servo systems, the Size 8 units and transistor amplifiers mark another milestone in miniaturization.

This is just one more example of how Transicoil can solve your control problems whether they involve miniaturization or control complexity, and go on to manufacture systems and components of the utmost precision and accuracy. You pay only for results—on a fixed fee basis for equipment delivered and performing properly.

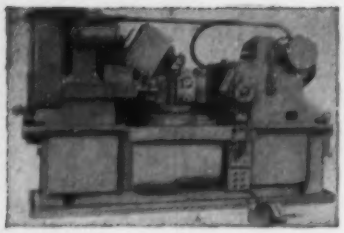
Technical data on the new Size 8 combination and the transistorized amplifier is yours for the asking. But you'll end up with a better system if you write outlining your servo control problem.



TRANSICOIL CORPORATION

Worcester, Montgomery County · Pennsylvania

Here's what is meant by "1·2·3" in the GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINE



The outstanding advantage of this machine is ability to handle operations on one, two or three ends of a piece simultaneously or in sequence, *without changing set-up or rehandling.* It is the only standard machine that will do this.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this machine.

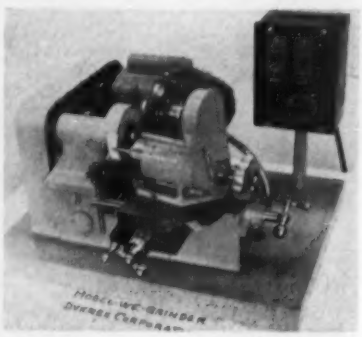
For complete details ask for illustrated bulletin. Send samples of your work for time and cost estimates.

GOSS & DELEEUW

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

plated and plunger is case hardened with a black-oxide finish.

Keystone Engineering & Mfg Co, 122 SW 16th St, Des Moines, Iowa



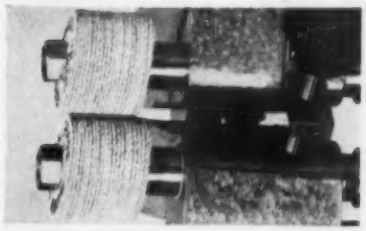
PIN AND SMALL-PARTS GRINDER, Model WE, will grind lapping pins or special parts up to a 90° included angle. Originally developed for a maker of telephone equipment, grinder is now offered in production model — *Dykrex-Roos Corp, PO Box 9022, Northeast Station, Newark 4, NJ*

Profile Projector and Comparator Offered in Two Sizes

Reportedly low in cost, profile projector and comparator is equipped to provide simple, fast optical inspection of various objects. Parts to be inspected are placed on the stage, which is mechanical, with movements in two directions by micrometers. Coarse and fine focusing is accomplished by controls for vertical movement of stage.

Available in two models, with viewing-screen measurements of 8 x 8 in. and 12½ x 11 in., instruments are equipped with objectives which give magnifications ranging from 10 to 50X.

Distributed by William J Hacker & Co, Inc, 82 Beaver St, New York 5, NY



WIRE-STRIPPING WHEELS accomplish work by "wobble" or oscillatory motion which causes the stripping surfaces of the wheels to move endwise relative to each other, thereby continually changing the points of wheel contact. Designated Type S, wheels made of specially bonded glass fiber are 1¼ in. in diameter and can be used on film-insulated wires ranging from AWG No. 25 (0.0179 in.) to No. 50 (0.001 in.)—*Eraser Co, Inc, 1068 S Clinton St, Syracuse 4, NY*

Templet kit containing four templets provides profile and detail drawings of screws, screw heads, and screw threads. Made of transparent Vinylite, templets cover a wide range of parts, reduce greatly the time required to make drawings on plans or designs. Kit sells for $8, but templets are also sold individually.

A Lawrence Karp, 16 Putnam Park, Greenwich, Conn

Torque wrenches can be calibrated quickly with an accuracy within ½% on portable, electrical SR-4 tester. Torque is measured by means of special SR-4 resistance wire strain gage-type transducers.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Penna

Automatic scanning recorders (50 point) for company's SR-4 strain gages have been improved in four ways: Two- or four-arm strain-gage bridges can be accommodated by positioning selector switch; fourth range of 0 to 1000 mu-in. has been added to ranges of 0-2000, 0-5000, and 0-10,000 mu-in.; individual stress-stain curves can be plotted automatically for each channel; and a chart-skipping mechanism has been provided to conserve chart paper when less than 50 channels are being scanned. Completion of a sequence of 50 readings takes 30 to 90 sec.

Baldwin-Lima-Hamilton Corp, Electronics & Instrumentation Div, 806 Massachusetts Ave, Cambridge 39, Mass

What is done is DONE... on the GOSS & DE LEEUW

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & DeLeeuw Automatic Chucker—provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

how to trap dust
that damages your machines and hurts company morale

Priced from $190.00

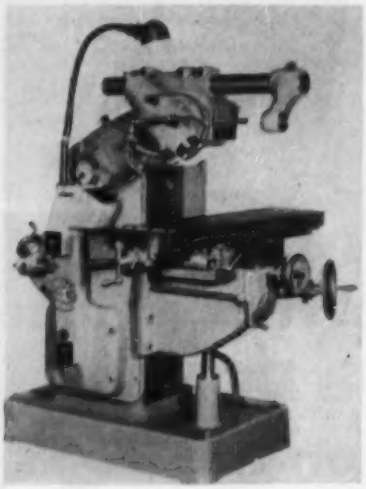
easy-to-move
TORIT DUST COLLECTORS
trap dust at its source!

Untrapped dust costs you money, "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-the-building) system. Torit unit operates only when machine or combination of machines it protects are in use. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to...

TORIT MANUFACTURING COMPANY

Dept. 406
311 Walnut Street
St. Paul 2, Minn.

NEW SHOP EQUIPMENT



MILLING MACHINE from Sweden, Abene Model VHF-2B, combines working scope of vertical and horizontal millers. Spindle can be placed at right angles with longitudinal line of table, and is adjustable for any angle from 0° in horizontal plane to 45° over vertical plane. Standard machine is provided with Morse No. 4 taper, but other tapers can be provided. Machine is delivered with coolant equipment and lighting—*Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, N Y*

SELF-LOCKING, SELF-SEALING FASTENERS called Nylok, available as screws, bolts, and other threaded parts, are available in a wide range of sizes. Locking medium is a resilient, protruding nylon pellet permanently inserted in the body of the threaded part. When mating parts are engaged, the spring-like wedging action of the nylon pellet locks and seals the mating threads together—*Nylok-Detroit Corp, 308 N Woodward Ave, Birmingham, Mich*

here are **10** *"reasons why"*
you'll be interested in
DI-ACRO* ROLLERS

1 Cam actuated idler roll—an exclusive feature—makes it possible to form small circles in one operation.
2 Larger circles are formed in two operations. No limit to maximum radius.
3 Bends are located at any point in metal—with straight sections on both sides of the bend.
4 Material other than sheet is also formed. Special rolls supplied for special forming jobs.
5 Eight models. Rated capacity to 16 gauge. Forming widths from 6" to 42".
6 Di-Acro Rollers are easy to operate.
7 Adjustments can be "locked in"—hundreds of parts precisely duplicated.
8 Long, trouble-free service, all machines backed by warranty.
9 Engineering Service at your disposal for the life of the machines.
10 Delivery is good. Cost is too.

**pronounced Die-ack-ro*

WANT MORE INFORMATION?

New catalog gives complete details on all hand and power operated Di-Acro machines. *Consult the yellow pages of your phone book for the name of your nearest Di-Acro distributor or write us.*

Creators of **"DIE-LESS DUPLICATING"**

O'NEIL-IRWIN MFG. CO.
311 8th Avenue
Lake City, Minnesota

di-acro PRECISION METALWORKING MACHINES

New melting-holding furnace solves "cold metal" problem

The problems caused by putting cold metal into a molten metal bath are now eliminated by this new melting-holding furnace—another new addition to the broad line of Surface® standard heat treat equipment. The furnace also offers three other major advantages:

rapid melting rates;
accurately-maintained metal bath temperature; and
greatly reduced ratio of molten metal in the bath to metal melted per hour.

If your melting capacity is more than 350 pounds per hour, you can put the advantages of this furnace in your plant. A phone call will bring your Surface representative with all the details.

SEND FOR BULLETIN SC-174 • SURFACE COMBUSTION CORPORATION • 2365 DORR ST., TOLEDO 1, OHIO

Surface
HEAT TREATING EQUIPMENT

oven furnaces • atmosphere furnaces • pot furnaces • convection furnaces • continuous furnaces • atmosphere generators • metal melting furnaces • air heaters • industrial burners

ACCO products

Wilson "Rockwell"* Hardness Testers

Production line speeds with laboratory accuracy

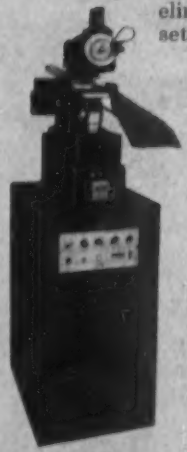
• There is a WILSON "ROCKWELL"* Hardness Tester to meet every requirement—from laboratory testing to automatic testing at the rate of 1000 pieces per hour.

J Model
Manually operated

Supplied in both NORMAL and SUPERFICIAL testing types. Designed for testing tools, machine parts and all ferrous and non-ferrous metals, hard or soft, except thin sheet steel.

Y Model Motorized

Suitable for testing work now being done with J models when it is advisable to increase testing speed. Motorized mechanism removes the major load in the test cycle. Set-O-Matic Dial Gauge eliminates need of manually setting dial gauge to zero.



Fully Automatic

Executes complete test cycle automatically at the rate of up to 1000 pieces per hour. Will classify tested parts as "correct," "too hard" and "too soft." Controls hardness limits within two Rockwell numbers. Has safety stop if pieces are not fed properly.

A WILSON hardness testing expert is located near you. Save time and money on your Testing problems. Write or call today.

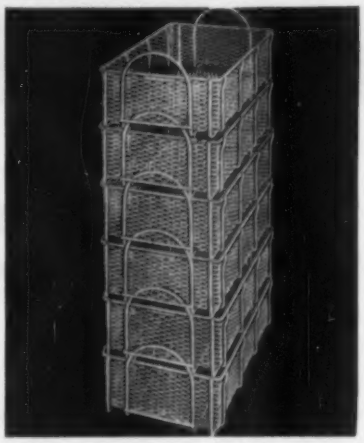
*Trademark registered

WILSON "ROCKWELL"...
the world's standard of hardness accuracy

ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-B Park Avenue, New York 17, N. Y.

for Better Value

HYDRAULIC THREE-WHEEL TOW TRUCK is a two-part combination of platform truck and tractor, so connected that the operator has control over direction of truck movement when the combined unit is being driven in reverse, as well as forward. Features include dual controls, battery power, and standard automotive and industrial components—*Tow-Bear Div, Hudson House, Inc, 401 SE Water St, Portland, Ore*

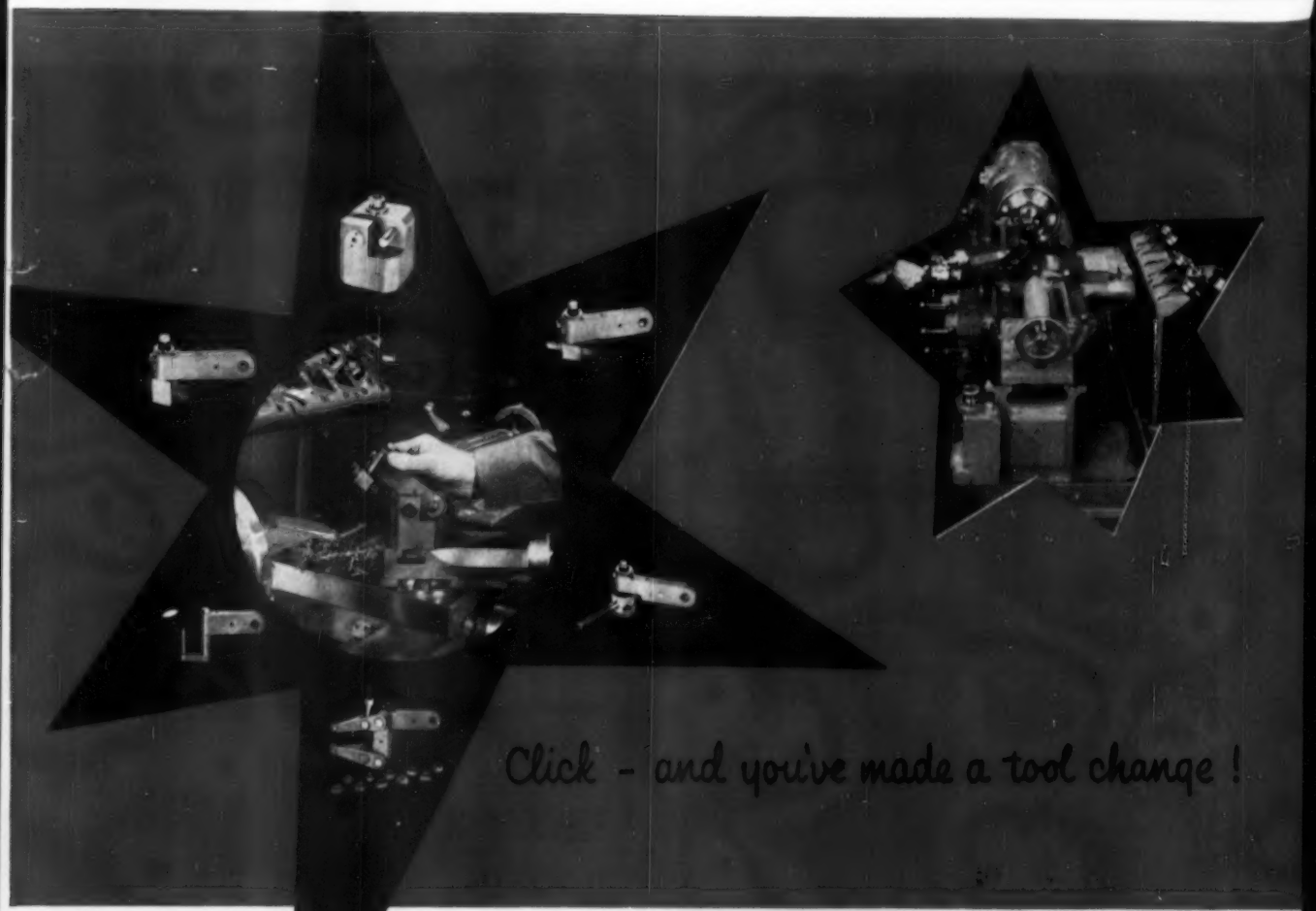


STACKING BASKETS for bulk parts, trade-named Eezy-Stak, are fabricated of flat expanded metal in open-mesh construction for quick drainage and easy cleaning. Inside dimensions are 12 x 20 x 5½ in. Interlock handle provides safe stacking and compact parts storage —*Wire & Iron Products, Inc, 1721 16th St, Detroit 16, Mich*

Skull cap for use in close quarters is designated No. 75. An elastic band, worn low on the back of the neck, adjusts cap to any head. Lightweight and comfortable, cap has a padded removable sweatband.

Boyer-Campbell Co, 6540 St Antoine, Detroit 2, Mich

(Continued on page 212)



Pre-Ground, Pre-Calibrated Monarch *QUIK-TOOL* Ready-Set Tooling Provides Immediate Tool Change

What's Quik-Tool? It's a tool block and set of seven tool holders, all precision ground and pre-calibrated to provide better accuracy of positioning and response than you get from any turret.

And it's fast! Tools automatically position themselves when slipped onto a locating pin and swung into the slot of the tool block. They don't even have to be aligned or clamped into position, as the precision fit of tool holder and tool block insures rigidity and accuracy.

Monarch Quik-Tools are specifically valuable in the toolroom or instrument shop for practically any type of turning, with tools used in any desired combination or sequence. The standard tool setups can be used, without adjustment to tool settings, for a wide variety of jobs. Holders are designed for standard tools and gages.

How about it? Don't you want to know *all* about how Monarch Quik-Tool eliminates lengthy setups and cuts tool change time to seconds? Send for our complete illustrated booklet today . . . . . ***The Monarch Machine Tool Company, Sidney, Ohio.***

Tool block fits any standard Monarch 10" Model EE Toolmaker's or Manufacturing Lathe compound rest "T" slot. Tools can be used in any combination or sequence for turning, boring, facing, chamfering, grooving, necking, threading, knurling, or cut-off. The tools automatically position themselves.

Monarch
TURNING MACHINES
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Fill Out This Coupon and Clip to Your Business Letterhead, Please

THE MONARCH MACHINE TOOL CO., SIDNEY, OHIO

Please Send Me Your Illustrated Quik-Tool Booklet #306.

NAME_____

TITLE_____

New Major Developments

from Henry & Wright and V & O Press

. . . for extending economics of progressive stamping

. . . for faster, safer feeding with geared presses

NEW HENRY & WRIGHT Double-Crank DIEING MACHINES

Here's a new H & W development designed to reduce the unit cost of metal stampings. Engineered to bear loads encountered in long progressive dies while maintaining precision registration of punch and die, H & W's Double-Crank assembly also offers you greater flexibility in ratio of die bed to press capacity. Thus you can: (1) form larger parts with lower capacity machines than before possible; and (2) handle stampings requiring high pressures with greater precision and longer die life than before. Special features of the new H & W Double-Crank machines include:

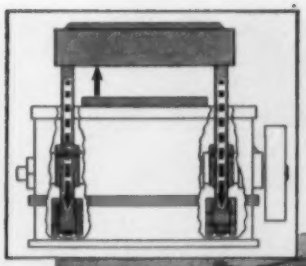
NEW V & O One-to-One FEED-O-MATIC

Now you can equip your geared pneumatic clutch presses with V & O Feed-O-Matics and gain all the advantages of precision automatic feeding — increased production, greater personnel safety, and precision quality control. The Feed-O-Matic for geared presses is driven directly from the drive shaft on a one-to-one ratio. Mechanical "fingers" of the Feed-O-Matic lift parts up, over and into the die for precise placement. High cost tools can be used with less fear of breakage and stop motions are eliminated. Write today for complete information.

PHONE, WRITE OR WIRE THE REPRESENTATIVE NEAREST YOU

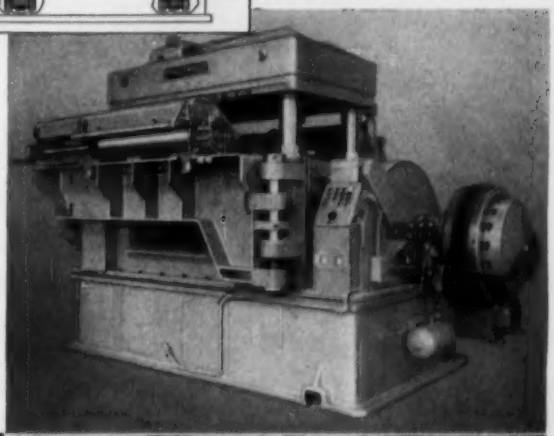
H & W — V & O

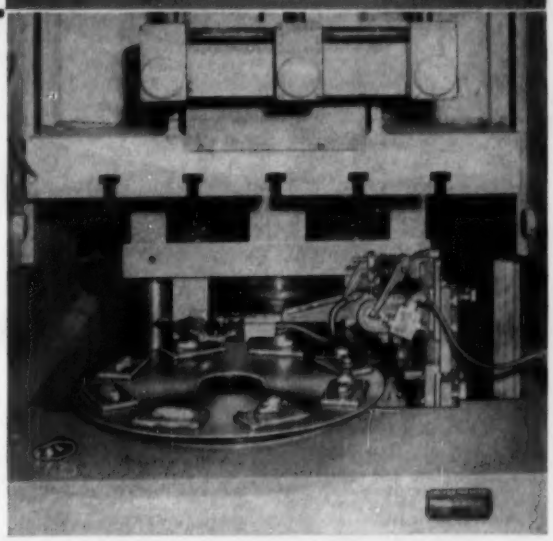
BOSTON, MASS.
Rudel Machinery Co., Inc.
BUFFALO, N. Y.
Rudel Machinery Co., Inc.
CHICAGO, ILL.
Bryant Machinery & Engineering Co.
CINCINNATI, OHIO
The Motch & Merryweather Machinery Co.
CLEVELAND, OHIO
The Motch & Merryweather Machinery Co.
DALLAS, TEXAS
Machine Tool Associates, Inc.
DAYTON, OHIO
The Motch & Merryweather Machinery Co.
FERNDALE, MICH.
The Motch & Merryweather Machinery Co.
INDIANAPOLIS, IND.
C. C. Garrett Machinery
KANSAS CITY, MO.
Bryant Machinery & Engineering Co.
c/o Fuchs Machinery & Supply Co.
LOS ANGELES, CALIF.
Harron, Rickard & McCone Co. of Southern California
MILWAUKEE, WISC.
Bryant Machinery & Engineering Co.
MINNEAPOLIS, MINN.
Bryant Machinery & Engineering Co.
MUSKEGON, MICH.
Bryant Machinery & Engineering Co.
c/o Lakeshore Machinery & Supply Co.
NEW YORK, N. Y.
Rudel Machinery Co., Inc.
OMAHA, NEB.
Bryant Machinery & Engineering Co.
c/o Fuchs Machinery & Supply Co.
PITTSBURGH, PA.
The Motch & Merryweather Machinery Co.
SAN FRANCISCO, CALIF.
Harron, Rickard & McCone Co. of Northern California
SEATTLE, WASH.
The L. C. Keir Co.



New 350-Ton Dieing Machine. Insert drawing shows advantages of new Double-Crank assembly.

(1) Completely enclosed to prevent chips, slugs, stock lubricating compound and other foreign matter from entering and damaging working parts; (2) A self contained recirculating lubrication system; (3) Large area chutes at front and rear for disposal of finished parts, scrap slugs and installation of stackers; (4) Swing-out type roll feed, solidly supported on knees when in operation; (5) Roll feed driving mechanism completely enclosed; and (6) Crosshead adjusting mechanism is conveniently located within the upper crosshead for easy accessibility. Write today for complete details.





The Feed-O-Matic® is simple and self contained, well enclosed, but highly accessible for servicing.

Behind each Henry & Wright - V & O representative are two engineering organizations geared to work out problems ranging from simple blanking to automated "packaged" presses. He will fit into your production planning team like the "pro" he is . . . adding his experience to yours in terms of your requirements.

Presses and methods that automatically reduce costs

SYRACUSE, N. Y.
Rudel Machinery Co., Inc.
WEST HARTFORD, CONN.
Rudel Machinery Co., Inc

H & W

PHILADELPHIA, PA.
John S. Wright
CANADA
TORONTO, ONT.
F. F. Barber Machinery Co

V & O

ASHEVILLE, N. C.
Tidewater Supply Co., Inc.
BIRMINGHAM, ALA.
McVoy-Hausman Co.
COLUMBIA, S. C.
Tidewater Supply Co., Inc.
KNOXVILLE, TENN.
Tidewater Supply Co., Inc.
NORFOLK, VA.
Tidewater Supply Co., Inc.
PHILADELPHIA, PA.
W. E. Shipley Machinery Co.
CANADA
MONTREAL, P. Q.
Rudel Machinery Co., Ltd.
TORONTO, ONT.
Rudel Machinery Co., Ltd.
VANCOUVER, B. C.
Rudel Machinery Co., Ltd.
WINDSOR, ONT.
Rudel Machinery Co., Ltd.

EMHART MFG. CO. PRESS DIVISIONS

HENRY & WRIGHT
HARTFORD, CONNECTICUT

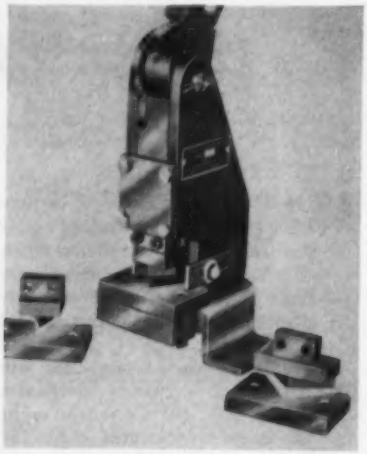
THE V & O PRESS CO.
HUDSON, NEW YORK

DIFFICULT JOBS ARE *routine on*

DE VLIEG SPIRAMATIC

EXTRA VALUE
AT NO EXTRA COST
PUSH DOWN TO UNLOCK
PUSH UP TO LOCK
THE EXCLUSIVE PATENTED LOCKING FEATURE...
of Williams new "push-button" adjustable wrench . . . is typical of the extra value you get in Williams tools.
Unmatched for feel, fit and finish . . . the entire line is expertly designed and precisely made to give you lasting, cost-saving service . . . and, they are so easy to get through your local distributor
A COMPLETE RANGE OF SIZES IN . . .
ALLOY "SUPERRENCHES"®
Over 30 patterns in 386 sizes from 3/16" to 3 1/4" openings.
CARBON WRENCHES
Over 30 patterns in 581 sizes with openings from 3/16" to 7 1/16".
"SUPERSOCKETS"®
1/4", 3/8", 1/2", 3/4", 1" Square Drives. Openings from 3/16" to 3 1/16".
POWER IMPACT SOCKETS
For all power and impact wrenches. Seven square drives 1/4" to 1 1/2". Hex and square openings 3/16" to 3 1/16".
TOOL HOLDERS AND SET-UP ACCESSORIES
A complete range of tool holders, lathe dogs, cutters, T-slot bolts and nuts, wedges, washers and strap clamps.
DROP-FORGED C CLAMPS
General and heavy service. Deep throat standard and spatter-resisting. Tool makers', and Machinists'.
HOIST HOOKS AND EYE BOLTS
Proof-tested Hoist Hooks, shank and eye patterns, 1/2 to 30 Ton capacities. Eye Bolts, plain and shoulder patterns, blank or threaded.
PIPE TONGS AND VISES
Tongs — 4 styles — 1/4 to 18" pipe capacities.
Vises — 2 styles — 1/8 to 8" pipe capacities.
PLUS Thumb nuts and screws, machine handles, rod ends, flange jacks, screw drivers, pliers, soft-face and ball pein hammers, punches, chisels, pullers, feeler gauges, body and fender tools, masonry bits, screw extractors, auger bits.
"THE BROADEST LINE OF ITS KIND"
WILLIAMS
INDUSTRIAL TOOLS
J. H. WILLIAMS & CO.

NEW SHOP EQUIPMENT



NOTCHER, Little Blacksmith No. 48, has capacity of 1/8-in. mild steel. It can be equipped with dies for any angle up to 90° and will notch 1 in. deep. 18-lb unit occupies a bench space of 6 x 4 in., costs $58 with one set of dies. Extra dies cost $16 per set —*J F Kidder Mfg Co, Inc, 426 Colchester Ave, Burlington, Vt*

SHEAR AND ROD CUTTER, Kar-ry No. 1, shears sheet metal up to 3/32 in. thick in any length and width, also cuts rods up to 5/16 in. dia. Larger model Kar-ry No. 2 shears sheet metal up to 3/16 in. thick, cuts round rods up to 1/2 in. dia. Extra attachments include automatic ejector gage, adjustable for cutting rods in lengths from 1 in. up; and circle cutter for circles from 1 1/2 to 10 in. in dia—*Progessive Tool & Mfg Co, 856 Foxon Rd, East Haven, Conn*

Shaped solder provides the exact amount of solder in the most efficient shape to perform joining operations. Called Solder Microforms, they are available in rings, disks, pellets, drops, segments, foil, pow-

NEW SHOP EQUIPMENT

DIFFICULT JOBS ARE *routine on* DE VLIEG SPIRAMATIC JIGMILS®

PHOTO COURTESY OF DANROY BORING CO.

DeVlieg *SPIRAMATIC* JIGMILS® permit accurate machining of workpiece from 4 sides at 1 setting!

The above photograph, taken in a well known Detroit Tool Shop, illustrates a Special Hydraulic Fixture being machined on a DeVlieg Model 3B-48 *SPIRAMATIC* JIGMIL. This job was completely machined on four sides at one setting to precise limits of accuracy and operations included drilling, boring, milling and Q.D. turning 22" diameter trunnion.

Come to Detroit...

See a practical demonstration of the JIGMIL Technique

DE VLIEG MACHINE COMPANY

450 Fair Avenue, Ferndale • Detroit 20, Michigan

WHY MONARCH lathe head stocks are MICROHONED

Monarch Machine Tool Company Microhones the spindle bores in its lathe head stocks because Microhoning . . . generates consistent finish, size, and alignment of bores . . . corrects out-of-roundness . . . eliminates cost of line-reaming operations . . . permits interchangeability of spindles and bearings.

And with the use of a new three-diameter Microhoning tool, honing time is reduced approximately 40% over former method which employed two double-diameter tools. One set-up now replaces multiple set-ups previously required.

APPLICATION DATA:

STOCK REMOVAL
.003" to .004"

TOLERANCES
diameter..... .0002"
roundness..... .0001"
taper..... .0001"

FINISH....20-25 microinches

PREVIOUS OPERATION
line boring

3 IN-LINE BORE SIZES
4.125" dia. x 1.500" long
5.118" dia. x 1.250" long
6.299" dia. x 5.125" long

Micromatic tooling for Microhoning applications is constantly furnishing manufacturers with cost reductions, higher production and better functional characteristics. A Micromatic Field Engineer will be glad to discuss your production problems and show you "Why" the proper Microhoning tools will help.

The principles and applications of Microhoning are explained in a 30-minute, 16 mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on _____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____ C

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

der, washers, balls, rectangles, and squares, with or without flux. Available in alloys with melting points of from 135 to 1700 F, shapes are made of tin and lead, tin and silver, lead and silver, lead and antimony, indium, and fusible and brazing alloys.

Anchor Metal Co, 244 Boerum St, Brooklyn 6, NY

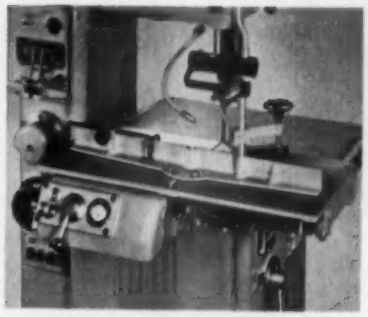
DRY-CHEMICAL FIRE EXTINGUISHING SYSTEM for flammable liquids and electrical hazards can be operated automatically or manually. Designated Model PS-30, system consists of a 30-lb-capacity dry-chemical unit, together with a special CO_2 cartridge which furnishes pressure to expel the dry chemical onto the fire through piping connecting the unit with the hazard area—*Ansul Chemical Co, Marinette, Wis*

Dow Corning Heat-Resistant Rubber Resists Swelling by Fuels, Oils

Known as Silastic LS-53, fluorosilicone rubber which is presently being used in aircraft applications, reportedly has outstanding resistance to swelling in contact with jet fuels, gasoline, high aromatic oils, and certain solvents. It is said to remain rubbery from – 80 to 400 F. Material has the tensile strength, ultimate elongation, and compression set comparable to conventional silicone rubbers.

Company reports that O-rings made of the material swelled only 20% when immersed for 70 hr at room temperatures in an aromatic test fuel. Conventional silicone rubbers swelled over 200% under the same conditions.

Dow Corning Corp, Midland, Mich



VERTICAL-CUTTING BANDSAW, German-made Kolle Model K-16, has hydraulic feed attachment and roller table. Feed pressure is adjustable up to 310 lb; table rides on ball bearings and may be used with hand or hydraulic feed. Bandsaw has a variable speed range from 33 to 2400 fpm, features a table that swivels 15° on all four sides—*Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, N Y*

BAR CROPPERS of Swedish design, called Hallto, cut rods up to 2 in. in diameter at up to 22 cuts per min. Croppers are hydraulic in operation, with automatic return stroke, and are designed to withstand up to 150-ton pressures. Stationary or portable models are available either electric-motor or gasoline powered. Prices range from $1300 to $1700—*Imported by Larson & Co, 13733 Ventura Blvd, Sherman Oaks, Calif*

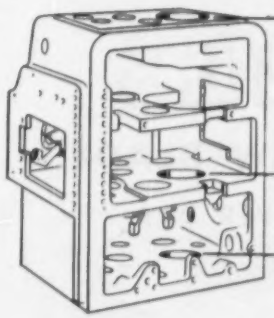
Corrosion preventative called Noox-id Safeguard is a water-based, non-flammable emulsion of waxes and oils in combination with corrosion inhibitors. Designed for protection of metal surfaces, liquid is applied cold by dip or spray and dries rapidly to form a transparent, wax-type film. It emits no noxious or explosive fumes.

Dearborn Chemical Co, Merchandise Mart Plaza, Chicago 54, Ill

HOW with one set-up MONARCH MICROHONES three bore diameters

Using a three-diameter tool and only one set-up, Monarch Machine Tool Company Microhones three in-line bores in lathe head stocks. Bore diameters are 4.125", 5.118" and 6.299". Stroke of Microhoning tool is changed only once during the working of all three bores. Former method of honing required multiple tooling and set-up.

How Monarch Microhones:



BORE "C"
6.299" Dia. x 5.125" Long

BORE "B"
5.118" Dia. x 1.250" Long

BORE "A"
4.125" Dia. x 1.50" Long

FIRST STROKE SETTING	Bore "A" is Microhoned while guiding on Bore "B" Bore "B" is Microhoned while guiding on Bore "A"
SECOND STROKE SETTING	Bore "C" is Microhoned while guiding on Bore "B"

How This Microhone Tool Operates:

A compound cone in the tool allows any one of the three bores to be Microhoned by expanding or collapsing individual banks of stones and guides. A selector sleeve shifts the cone rod to provide positive control of abrasives and guides.

Micromatic "How" knowledge, obtained through 27 years of experience in designing, engineering and manufacturing of Microhoning equipment for all types of applications throughout the world, can solve your production honing problems.

Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____ C

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

F. Jos. Lamb Co. now uses Barnes Rocket Hack Saw Blades for low cost slotting operation.

BARNES

POWER HACK SAW BLADES

SAVE $360.00 PER DAY

Slotting a set of 8 support arms was costing the F. Jos. Lamb Co. $60.00. The problem was presented to a Barnes' field engineer. He gathered the facts, including one that Lamb was seriously considering the purchase of new equipment for the job costing approximately $2,000.00.

The Barnes engineering department, after thorough study, recommended that the slotting be done by hack sawing. Barnes Rocket Blades, RT 1406-6, would give the correct slot width and insure straight, accurate cuts. A special fixture was designed adapting one of Lamb's hack saw machines (Cost: *less* than $200.00).

F. Jos. Lamb's new Stor-Matic Hitch-Lift is placing automation within the reach of all manufacturers. The Stor-Matic automatically stores and feeds semi-processed parts between standard machine tool operations.

The result—production of 4 sets for the previous cost of 1 set. Based on two shifts, this is a savings of $360.00 per day. In addition, F. Jos. Lamb Co. is obtaining more cuts per blade from Barnes Rocket Hack Saw Blades and immediate delivery from the stock of their local Barnes distributor.

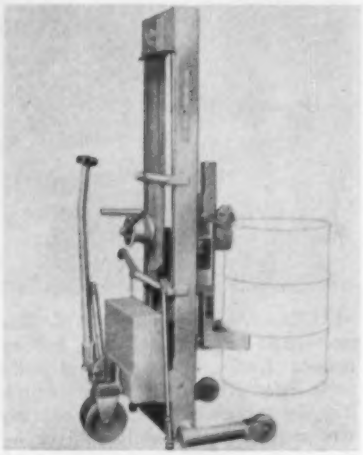
The services of an experienced Barnes metal cutting engineer are available to you through your Barnes distributor. His recommendations on your hand, power or band saw requirements will increase your production and lower costs. Call your Barnes distributor today.

when cutting counts BARNES *count on Barnes*

W. O. BARNES CO., INC.

1297 TERMINAL AVENUE DETROIT 14, MICHIGAN

NEW SHOP EQUIPMENT



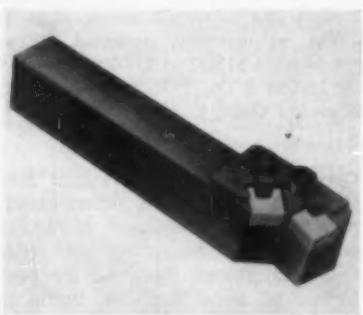
Lewis-Shepard Stacker Handles Large Drums

Designed to handle and to double-tier fiber and steel drums, stacker has a capaciy of 550 lb and a lifting height of 38 in. to the underside of a standard 55-gal drum. Its over-all height is 76 in. and over-all width is 28 in. 8-in.-dia front wheels with truck steer and 5-in.-dia rear wheels assure easy steering and pulling.

Stacker is equipped with company's Lift-O-Matic drum-handling attachment, which clamps the top lip of the drum and which can handle any drum regardless of diameter or height. Jaws can handle open or closed, removable-lid, and fiber or light-gage drums equally.

Drum is cranked up and down at a speed of 1½ ipr. Hand-operated floor lock prevents movement of stacker while load is being raised or lowered.

Lewis-Shepard Products, Inc, Dept R-31, Watertown, Mass



Kendex Insertable-Index Tool Faces and Chamfers

Sixteen indexable cutting edges per button insert are available for facing and chamfering in a single

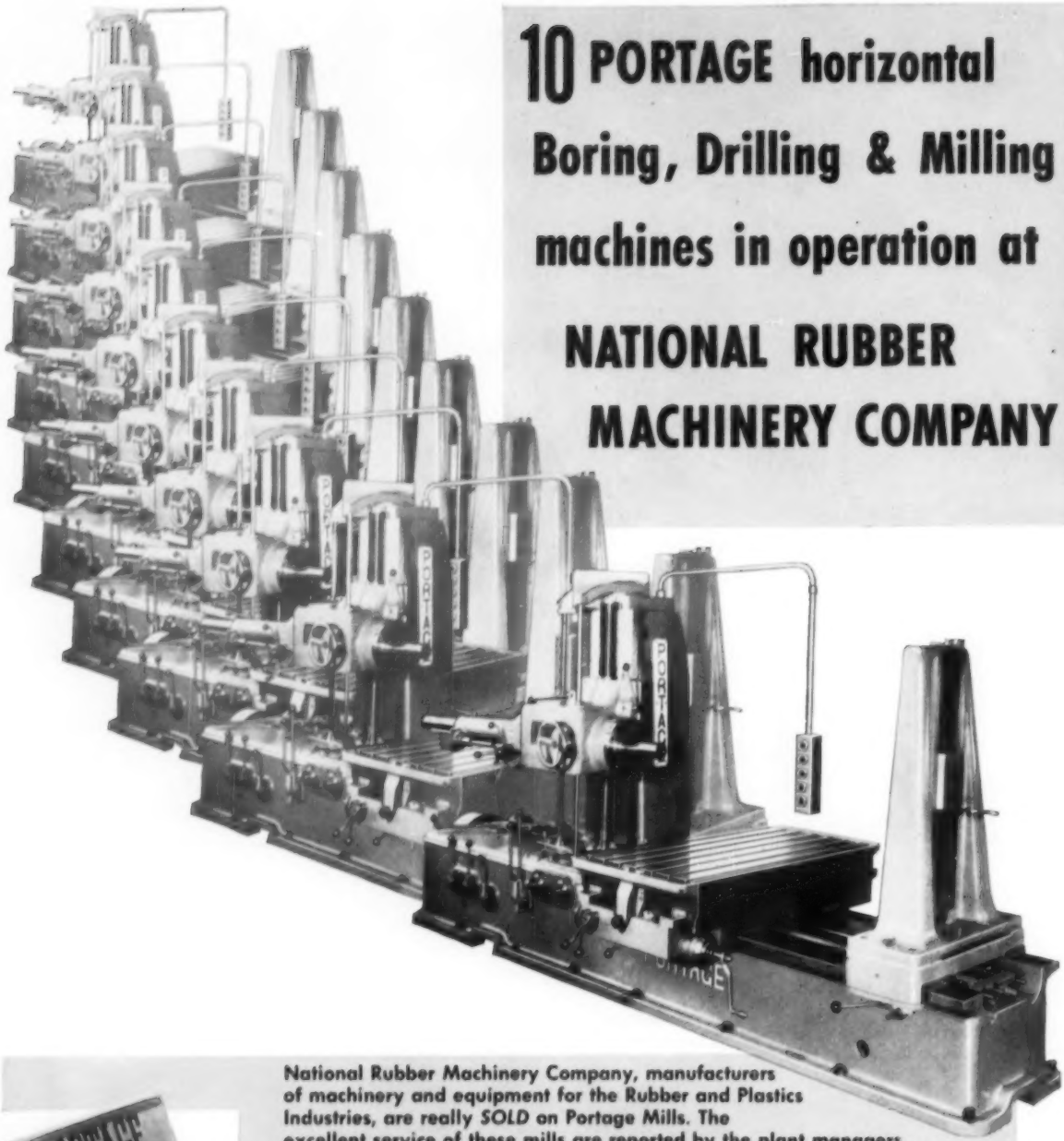
"Yep, Biggest Stock in Town!"

That's what most GREENFIELD Distributors can boast when you ask about threading tools and gages. In fact, chances are that a GREENFIELD Distributor is *The Cutting Tool Center* in your trading area. His knowledge of local demand and of suppliers, his stocks on hand, his ability to give service, all are yours when you buy through a distributor.

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

Buy taps from DISTRIBUTORS • • • from GREENFIELD DISTRIBUTORS

10 PORTAGE horizontal Boring, Drilling & Milling machines in operation at NATIONAL RUBBER MACHINERY COMPANY



National Rubber Machinery Company, manufacturers of machinery and equipment for the Rubber and Plastics Industries, are really *SOLD* on Portage Mills. The excellent service of these mills are reported by the plant managers at Columbiana, Ohio and the Akron Division plant. This large installation certainly represents a vote of confidence for the performance of Portage Mills . . . and speaking of confidence . . . many leading manufacturers have come to realize that the ruggedness, versatility and low maintenance cost of Portage Mills makes them the best buy . . . and remember . . . their initial capital investment cost is less, without the sacrifice of quality. Write for complete information . . . TODAY.

THE Portage MACHINE CO.

1026 Sweitzer Avenue • Akron 11, Ohio

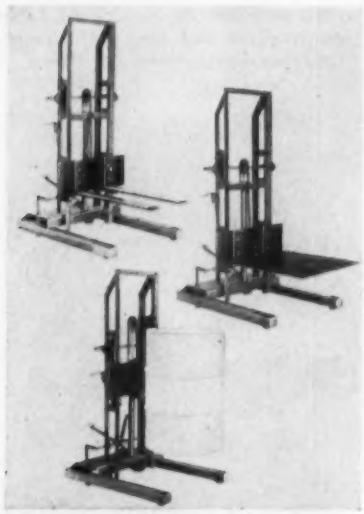
Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

operation with two-in-one Kendex tool. "Turnover" carbide-button inserts are only ½ in. square.

Only the middle of the chamfering insert is used, so that the two inserts can be exchanged when each has been used in eight positions.

Kennametal, Inc, Latrobe, Penna



Manual Lift Truck Offered In Multi-Purpose Model

Multi-purpose lift and drum stacker in company's Safeway line combines forks, platform, and drum-handling attachments with a pedal-operated straddle lift truck. Forged-steel forks can lift 1000 lb to a height of 68 in.

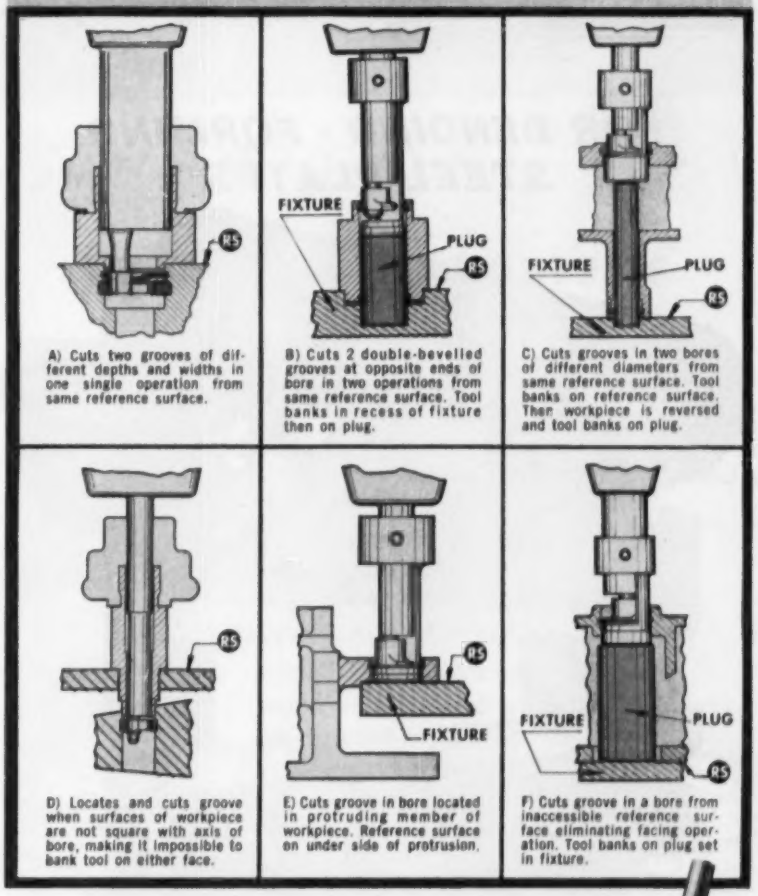
Unit converts to platform truck when steel platform is slipped over the forks. When the four bolts which fasten the forks in place are removed, a drum-stacker attachment can be used on the truck; this attachment enables operator to stack 55-gal drums weighing up to 500 lb.

American Pulley Co. 4200 Wissahickon Ave, Philadelphia 29, Penna

Pitt Air-Operated Rotary Table Handles 500-lb Loads

Air-operated rotary indexing table with 26-in. diameter is designed to

Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!



A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

Amazingly versatile! Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

Wide Cutting Range! The Waldes Truarc Grooving Tool comes in 5 models...enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

Send Your Problems to Waldes! Send us your blueprints...let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 26-page manual containing full information on Waldes Truarc Grooving Tool

WALDES TRUARC® GROOVING TOOL

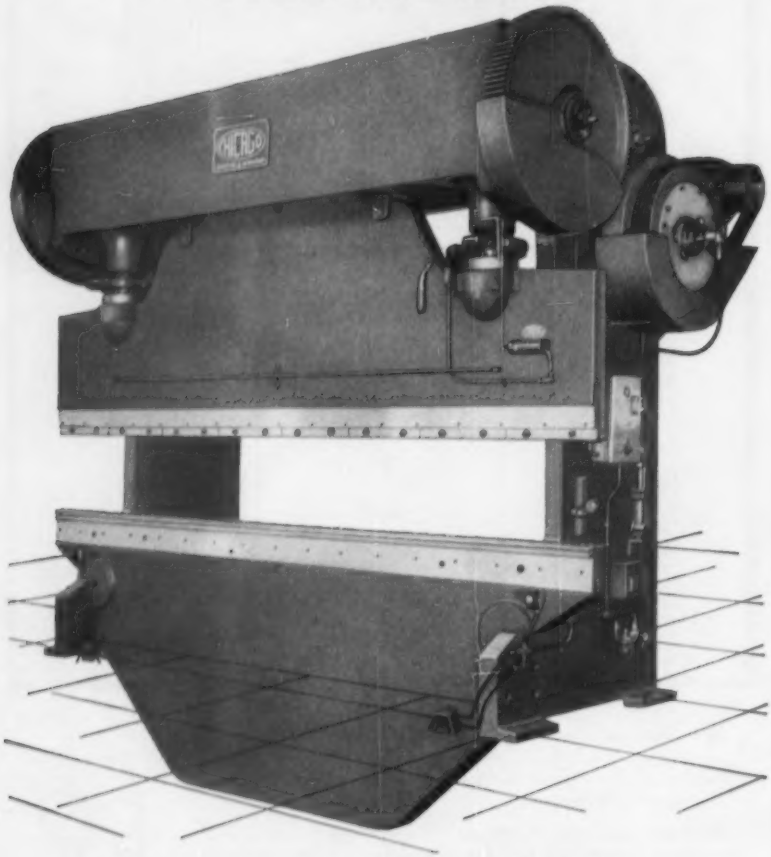
Made by the Manufacturers of Waldes Truarc Retaining Rings
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.
Waldes Truarc Grooving Tool Manufactured Under U. S. Pat. 2,611,426

AM-12S
Waldes Kohinoor, Inc., 47-16 Austel Pl., L.I.C. 1, N. Y.
Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)
Name_____
Title_____
Company_____
Address_____
City_____ Zone_____ State_____

CHICAGO DREIS & KRUMP

Press Brakes

FOR BENDING • FORMING STEEL PLATES



The most modern design throughout with all the features for the fastest bending and forming of steel plates. Large variety of standard sizes and capacities. Also modified designs for special production work.

Complete Engineering Recommendations for Any Job on Request 6160

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side Presses • Press Brake Dies

Hand and Power Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.

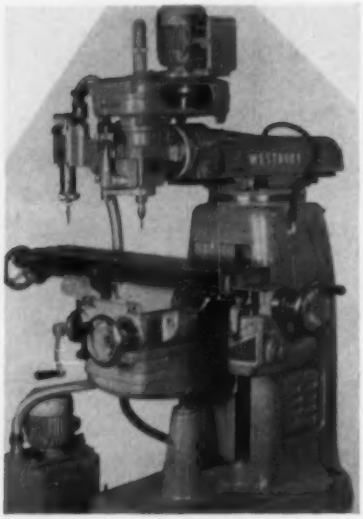
7434 South Loomis Boulevard, Chicago 36, Illinois

NEW SHOP EQUIPMENT

handle loads up to 500 lb. Operating pressures range from 75 to 100 lb on the unit, which is available with from 6 to 18 stations.

An adjustable hydraulic control assures cushioned stops under all load conditions. Splash oiling system reportedly permits all hardened moving parts to be fitted to a close tolerance, said to provide indexing accurate to ±0.0005 in. Two micro switches on outside of table permit quick and easy adjustment.

Pitt Industries, Carnegie, Penna



Italian Contour Miller Has Hydraulic Duplicating Head

Westbury vertical milling machine, imported from Italy, is designed for diesinking operations in the reproduction of such work as dies and molds. It may also be used for milling complex profiles and other intricate shapes.

Hydraulic duplicating head provided on machine has 12 spindle speeds ranging from 300 to 3700 rpm. Duplicating-spindle travel is 3⅝ in., and vertical adjustment is 3 9/16 in. Total power required for head, which has sensitivity of 0.00012 in., is 2 hp.

Working surface of machine table is 42 x 9 in. Table travels are 30 in. longitudinal, 10 in. cross, and 16 in. vertical. Machine requires a floor space of 88½ x 80 in.

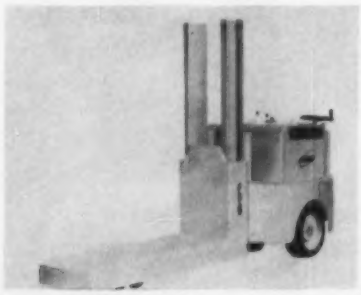
Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 13, NY

Optical micrometer has been added to Hilger & Watts Projection Angle Dekkor, so that direct readings to ½ sec can be obtained. Instrument combines principles of auto-collima-

NEW SHOP EQUIPMENT

tion with a projection screen and a precision micrometer. When a plane reflecting surface is placed in front of the objective lens at any distance within range of the instrument, the scale image can be read on the projection screen clearly and without eye strain.

Distributed by Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill



Elwell-Parker Platform Truck Has 10,000-lb Capacity

Model E13-10 electric-powered platform truck features two-wheel drive, six-wheel steer, is hydraulically actuated, and is of end-control stand-up, non telescopic design. Truck has 10,000-lb. capacity.

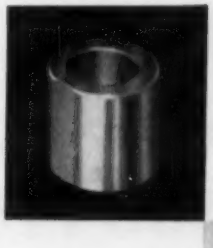
Frame is built of heavy steel plate which is electrically welded. All major parts are attached directly to the heavily reinforced alloy-steel bars which form the sills.

Hydraulic lift cylinder operates the platform lift. Check valve built into lift cylinder prevents sudden dropping of load should the system rupture at any point. An automatic unloading device prevents damage when the platform reaches its limit of travel or in the event it strikes an obstruction.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio

Double-solenoid air valve, Model 2441-500, is offered in a four-way version with 4-port or 5-port (2 pressure) design. Valve utilizes a spool pilot which, when one solenoid is energized, moves and causes the main valve to be shifted. Main valve stays in this position until the other solenoid is momentarily energized, then shifts back to the original position. This construction provides a safety factor, because the valve will not reverse with electrical failure. Valve is offered in sizes of ¼, ⅜, ½ and ¾ in.

Automatic Valve Co, 37415 Grand River Ave, Farmington, Mich



THE *simplest answer* TO BEARING PROBLEMS

Bunting capability and leadership in the field of Cast Bronze Bearings and parts are well established and widely recognized. Today Bunting offers an equally comprehensive and responsible service in the field of Sintered Powdered Metal Bearings and parts.

Bunting's special knowledge and facilities make Sintered Powdered Metal products available in many applications not heretofore considered feasible. We can help you find the simplest answer to your individual problem, be it Cast Bronze or Sintered Metal.

A wide range of stock sizes of Bunting Cast Bronze and Sintered Powdered Bronze self-lubricating, plain and flange bearings, thrust bearings and bars are available from Bunting distributors everywhere in America.

Write for catalogs.

Bunting®

BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

PRECISION CONTROLLED

MASS Production!

HYDRAULICALLY CONTROLLED

ENGELBERG

NEW WET-DRY BELT-GRINDER MODEL

BG8A-FT9

DESIGNED FOR . . . profitable mass production, The Engelberg Model BG8A-FT9 accurately grinds large surfaces or gangs of parts in a fixture with extreme rapidity.

EASY SETUP, changes take but a minute or two. Grinding grits make multiple, overlapping straight line cuts that produce *smoothness without tool marks.*

FAST MACHINING is assured by high speed wet or dry abrasive belts, backed by a ground steel platen. Controls are pre-set for feed and pressure. Quick approach of ball-bearing table is followed by hydraulically controlled in-feed down to Micro-Stop limit. Eliminates waste . . . cuts cost. New design incorporates larger pump and coolant capacity with easier access for clean-out. Redesigned one piece frame plus wrap-around splash guard.

SPECIFICATIONS

Automatic Table Surface	13" x 28"
Capacity	9" x 11½", 13½" or 17½"
Abrasive Belts	8" or 9" x 107"
Drive Units	5 or 7½ HP
Belt Speeds	(5 HP) 4100 SFPM standard; 2550, 3550, 4600 optional (7½ HP) 5000 SFPM standard; 2500, 3500, 5500 optional
Coolant Capacity	85 gallons
Overall Dimensions	Height 72½"; width 44"; depth 48"

THE ENGELBERG HULLER CO., INC. 192 Seneca St. SYRACUSE, N.Y.

Please send complete information of the new BG8A-FT9 abrasive belt grinder and the advantages of this method of stock removal and surfacing.

Firm_____

Name_____

Address_____

City_____ Zone____ State_____

Parker Hydraulic Marker Produces 8000-lb Pressures

No. 710 hydraulic marking machine, smaller than normal hydraulic markers, stands on a 18 x 20-in. space. Machine performs marking operations requiring up to 8000 lb pressure, with a maximum lettering length of 3½ in. It will stamp up to 4 lines of 1/16-in. characters.

Unit is built with a heavy die slide which operates on roller bearings. It will accept flats up to 5 in. thick, rounds to 5 in. in diameter. A handwheel adjustment moves the table 4 in. up or down. Single control knob adjusts the pressure. Production capacity is 800 to 1000 parts per hr.

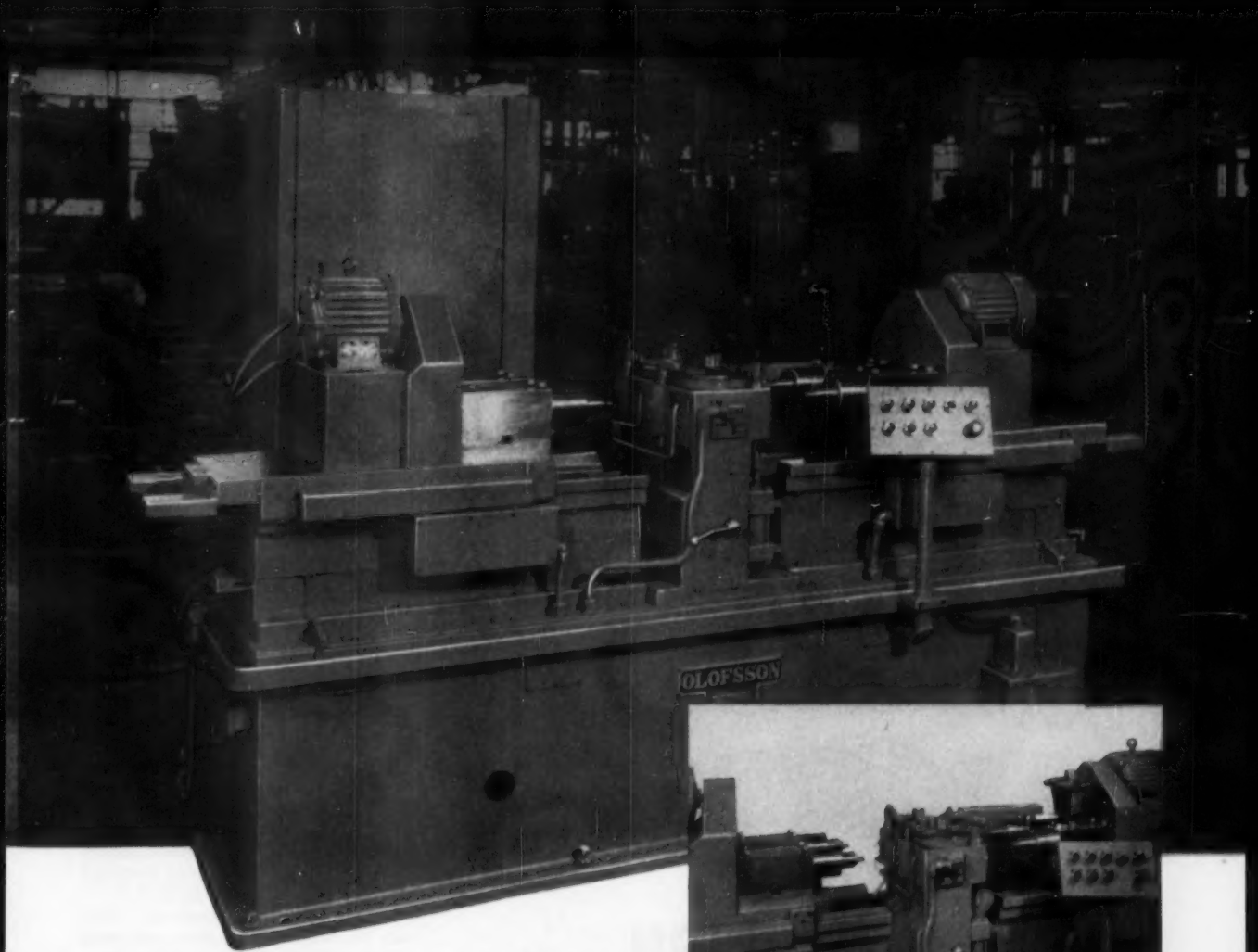
Parker Stamp Works, Hartford, Conn.

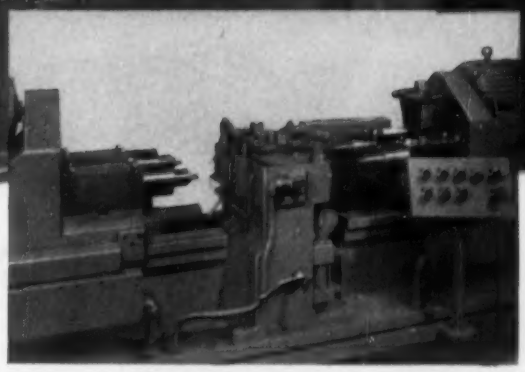
Adjustable die lights designed for company's presses can be adjusted to all shop conditions. Switch on control panel enables operator to vary light from "bright" to "off" through an uninterrupted choice of intensities. Die lights are built into press upright and have frosted glass covering.

Clearing Machine Corp, 6499 W 65th St, Chicago 38, Ill

Hydraulic four-way valve, Model 5950, is air-pressure operated by air pilot valve. This feature permits using the valve automatically when the air pilot valve is controlled mechanically. Unit is available in standard-action, spring-return, and spring-centered models. Designed for 1500-psi service, valve is offered in 7 sizes between ¼ and 1½ in. Catalog 204.

Rivett, Inc, Brighton 35, Boston, Mass





Olofsson Two Station Precision Boring Machine arranged with Way Units. Conforms to J.I.C. electrical and hydraulic standards.

Is any part of your production COSTING TOO MUCH?

Today's competitive market demands constantly increasing production per man hour. Any machine tool which can't deliver that kind of production is too costly to operate. That's why an automotive manufacturer recently consulted with Olofsson engineers to increase production and lower unit costs on a boring operation. The result...

TYPE OF MACHINE—Olofsson Two Station Double End Precision Boring Machine arranged with Way Units.

WORK PERFORMED—Finish bore two holes, *in line,* simultaneously in cast iron differential cases.

RATE OF PRODUCTION—250 cases per hour.

MACHINE OPERATION—The operator loads the part into the nest and presses the clamp and start cycle button. Both units bore "in" simultaneously and rapid return to unload position. Hydraulically operated finger clamps release the part automatically when both units are in clear position. A manually operated elevator device is used to help insert and unload part from nest with ease.

Hand cycle provides additional retraction of spindles for setting or removal of cutting tools, also independent control of either unit.

Perhaps you have a tough production problem which can be solved efficiently and economically with Olofsson Special Machinery. You'll find it "pays to specialize with Olofsson".

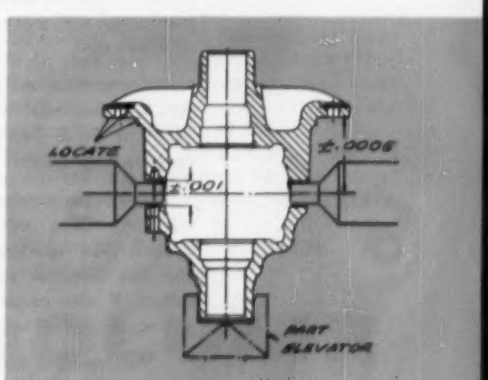


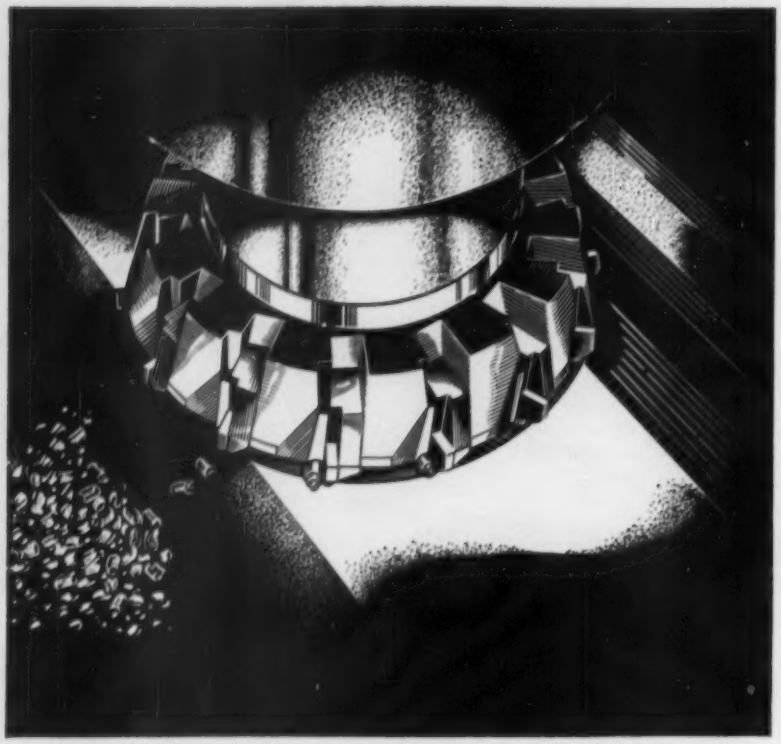
Diagram of differential case clamped into position for simultaneous, double-end precision boring operation.

Put the Olofsson Engineering Department to work for you. Write today. Or phone us at IVanhoe 4-5381, Lansing, Michigan.

THE OLOFSSON CORPORATION

2730 Lyons Avenue • Lansing, Michigan

Manufacturers of Special and Automation Machinery and Precision Boring Machines



"MISTREATED MASS PRODUCTION MANIAC"

That's the inserted blade carbide tipped milling cutter. Here's a tool that really outperforms ordinary milling cutters when it's used right. It makes possible increased production with more pieces per grind and better finishes at lower cost.

Economical milling with carbides requires careful tool engineering. This has been recognized for many years at Go & Go. Failure to do so has soured many a carbide application.

Go & Go produces a complete line of inserted blade carbide milling cutters including tools designed for specific jobs (specials). We think they're the finest you can buy because sound engineering comes with these cutters. If your application isn't right for them, we'll tell you so. And we'll tell you how to make it right.

For specifications on a really complete line of inserted blade carbide milling cutters, ask for Catalog "F". Or better still, consult the Go & Go engineering sales representative in your area.

GO & GO

GODDARD & GODDARD COMPANY
DETROIT 23, MICHIGAN
Engineering and producing tools that Go & Go since 1917.

NEW SHOP EQUIPMENT

Self-contained conveyor unit called Lanceveyor is set into user's present system and by means of an automatic control circuit may be extended through dock doors onto trucks, permitting direct handling to or from truck. Unit is automatically extended or retracted to compensate for space changes in load handling, as load is increased or reduced. It can also be raised or lowered to level with bed or top of truck, or for any intermediate height desired. Travel speed of conveyor belt can be synchronized with plant conveyor pace.

Lance Iron Works, Box 310R3, Chicago Heights, Ill

Clark Cam Limit Switch Has External In-Motion Adjustment

Type AL cam-operated rotating limit switch, designed to facilitate precise synchronization of multiple operations, features a micrometer-screw adjustment of each individual contact assembly in relation to its cam. Adjustment can be made with a screwdriver from the outside while the switch is in motion.

Switch is made in three standard sizes accommodating up to 5, 9, or 12 cams. The split butterfly cams can be set with a spread between make and break of from 15 to 345°, and the outside in-motion adjustment of ±15° makes final synchronization possible while equipment is in operation.

Contact assemblies have two sets of contacts, one normally closed and the other interchangeable between normally open and normally closed. Contacts have 15-amp capacity. Cams are individually adjustable and removable without disturbing the other cams. Contacts can be removed and replaced without disassembling the switch.

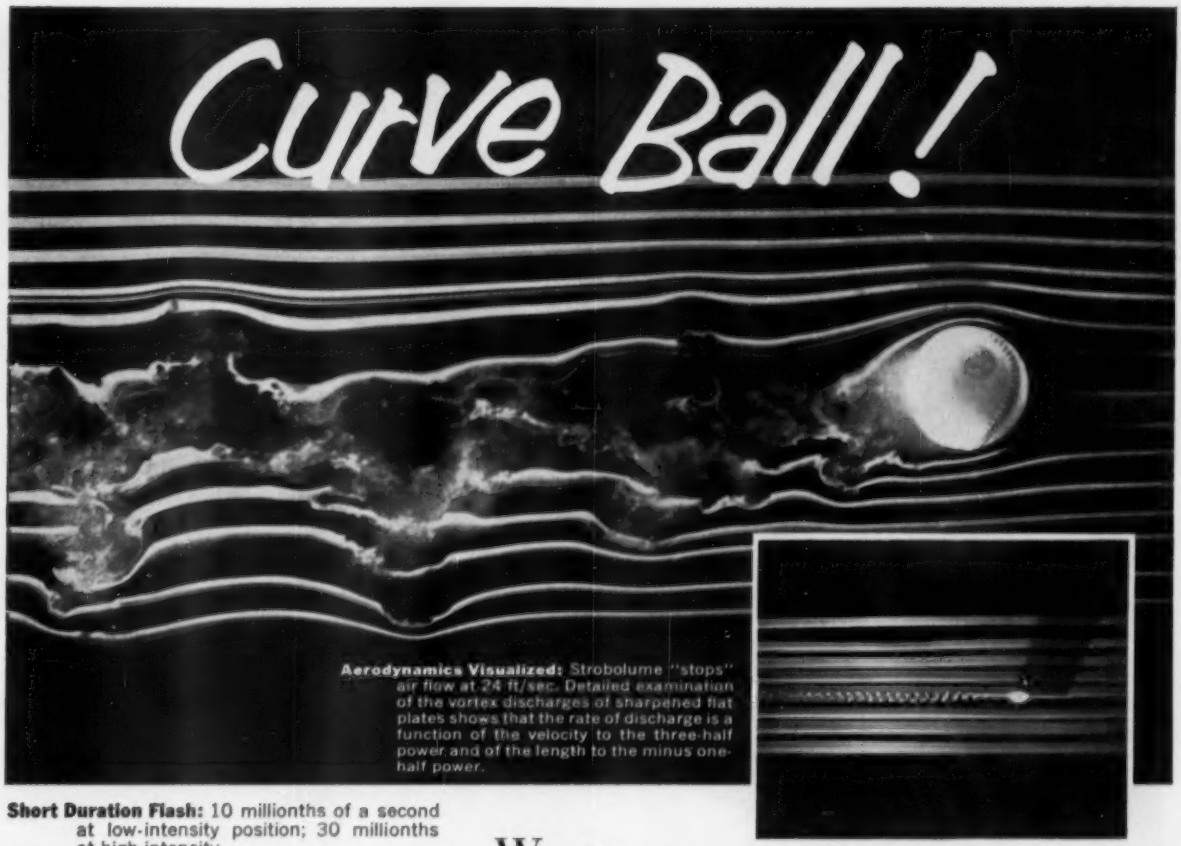
Switch is designed to operate at speeds up to 100 rpm, and rotation can be clockwise or counter-clockwise.

Clark Controller Co, 1150 E 162nd St, Cleveland, Ohio

Portable stock reel is capable of handling coils from 4-in. to 10-in. ID, weighing up to 50 lb. Coils may be ¼- to 2½-in. width. Reel features self-centering of coil, is equipped with frictionless needle bearings and a brake to control de-reeling speed. Post height is 36 in. Three sizes of side-supporting disks are available: 16, 20, and 24 in.

H E Dickerman Mfg Co, 321 Albany St, Springfield, Mass

Curve Ball!



Aerodynamics Visualized: Strobolume "stops" air flow at 24 ft/sec. Detailed examination of the vortex discharges of sharpened flat plates shows that the rate of discharge is a function of the velocity to the three-half power and of the length to the minus one-half power.

Short Duration Flash: 10 millionths of a second at low-intensity position; 30 millionths at high intensity.

Light Intensity: eight million beam candles, 400 times that of ordinary stroboscope.

Speed Range: up to 3000 flashes per minute; 1200 per minute, maximum, on high-intensity flash.

Ease of Operation: light source is simply aimed at subject; because there is no physical connection between stroboscope and object under study, there can be no instrument effect on operation.

Removal Lamp Housing: lamp may be used at end of 14-foot cable to reach otherwise inaccessible places.

Versatility: can be synchronized with any simple make-break device, or controlled by G-R Type 631-BL Strobotac or Type 1535-B Contactor; push button provided for manual flashing.

Compactness: 7½" x 13" x 11"; 18½ lbs. over-all; lamp assembly only 2 lbs.

Type 1532-B Strobolume $275

What effect do the seams of a baseball have on its wake and on its path of travel? The answer: wake effects are very small — and, seams actually improve path stability, aiding the pitcher's control. To determine this, Professor F. N. M. Brown, of the University of Notre Dame, photographed first a speeding baseball and then a perfectly smooth sphere with the aid of high-intensity, short-duration light flashes produced by General Radio stroboscopic equipment.

The ball was photographed in a small wind tunnel filled with smoke streamers to make the air flow visible. Photographs were taken with a standard Graphic View camera which was synchronized with three G-R Strobolumes to provide an intense white light with exposure time of 20 microseconds.

Studies conducted with the "visualization" technique described here have established many aerodynamic facts. (See inset photograph above.) The Strobolume's ability to "stop" rapidly moving objects has proven of great value to researchers such as Professor Brown. Others, engaged in a variety of development and research programs, have benefited as well.

For the designer or engineer, stroboscopic light is a tool which permits detailed visual examination of rapidly moving mechanical parts and cyclic operations with a *convenience*, *rapidity* and *effectiveness* not otherwise available.

Write For Complete Specifications and Details Concerning G-R's Complete Line Of Stroboscopic Instruments.

STROBOLUME

Made and Sold Exclusively by

GENERAL RADIO COMPANY

275 Massachusetts Avenue, Cambridge 39, Massachusetts

Broad Avenue at Linden, Ridgefield, N. J. **NEW YORK AREA** 920 S. Michigan Ave. **CHICAGO 5**
1150 York Road, Abington, Pa. **PHILADELPHIA**
8055 13th St., Silver Spring, Md. **WASHINGTON, D. C.** 1000 N. Seward St. **LOS ANGELES 38**

WE SELL DIRECT, Prices are Net, FOB Cambridge or West Concord, Massachusetts

AUTOMATION

that's not "set in its ways"

Automation with Baker Basics is not limited to producing just one part. For Baker Basics are *standard* machines . . . easily retooled for changes in your product or production methods. Cost much less, too, than a specially built machine. So Baker Basic Automation pays for itself even on lower production runs. Yet you still get *full* automation with loading and unloading devices and conveyors, which we can furnish as well as tooling. Use singly or in battery as a transfer machine . . . for drilling, boring, tapping, facing and other machining operations.

BAKER

AUTOMATION

Best in the long run
Practical in the short run

.. Mail Coupon Today ....

BAKER BROTHERS, INC.
Dept. AM-1256
Toledo 10, Ohio

Please give me the full story on automating with Baker Basics.

NAME AND TITLE

COMPANY

ADDRESS

CITY ZONE STATE

NEW SHOP EQUIPMENT

Hardsurfacing flux H-560 is used with the submerged-arc welding process to produce a hardsurfacing deposit using a mild steel electrode. Flux is an agglomerated mixture of fluxing materials and alloys which will produce a high-carbon, high-alloy weld deposit when used with electrode wire. It will reportedly make a deposit with a hardness of 53 to 61 Rockwell R_c, will perform under abrasive conditions at temperatures as high as 1100 F.

Lincoln Electric Co, 22777 St Clair Ave, Cleveland 17, Ohio

Boring-chuck set is offered which will bore any size hole from 5/32 to 5 in. Designed for use with company's jig borers, set contains a reducer bushing which makes possible the use of either ½- or ⅜-in.-shank toolbits. Bits are available in HSS or carbide. Boring chuck is completely dust-protected, has dial with 50 graduations which increase the hole 0.001 in. in dia per graduation. Available shank adapters permit use of set with all machines with No. 40 tapers and with all Bridgeport millers.

Moore Special Tool Co, Inc, 740 Union Ave, Bridgeport 7, Conn

Ignitron tube for control of frequency-changer resistance welders, Type WL-5822-A, directly replaces older Type WL-5822. Capable of intermittent ignitor service, tube is sealed, stainless-steel jacketed, water cooled, and mercury-pool design. It has a 1200 or 1500-v maximum anode voltage rating with 1500 or 1200 amp maximum anode current. Tube features a provision for thermostatic control which, when equipped with thermostatic switches, conserves cooling-water consumption and protects tube from overloads and overheating.

Westinghouse Electronic Tube Div, Box 284, Elmira, NY

Lubrication cycle counter, the Alemite Accumatic, provides visual proof as a guard against bearing failure due to faulty lubrication. Device, which provides an automatic, permanent record of bearing lubrication, registers the exact number of times that the lubricant valve is discharged. Furnished as a kit, it can be installed without removing the valves from company's Type II Accumatic lubrication sysem, in which it is designed to be installed.

Stewart-Warner Corp, Alemite Div, 1826 Diversey Pkwy, Chicago 14, Ill

Jack Berger, General Foreman, Lehmann-Brandes Machine Company, St. Louis, Mo., and R. A. Loughman, Gulf Sales Engineer, watch George Mayer operate his turret lathe on Gulfcut. Gulfcut oils excel over a wide range of metal cutting applications—this firm uses Gulfcut exclusively on gear shapers, milling machines and all other machining operations, for long tool life, lower costs.

"Day in, day out, month after month, we get better results with GULFCUT"

says Jack Berger, General Foreman of Lehmann-Brandes Machine Company, St. Louis, Missouri

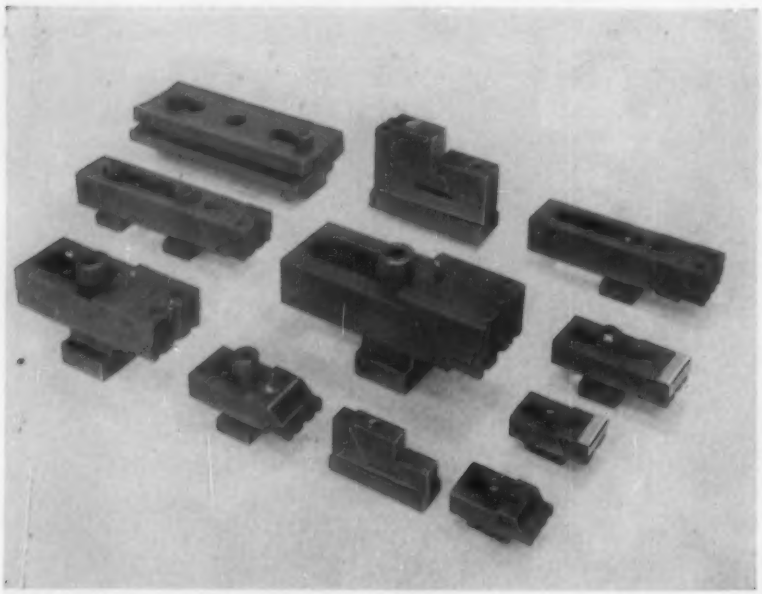
Lehmann-Brandes, manufacturer of engine lathes, high-speed production presses and special machinery, uses Gulfcut cutting oils because they deliver longer tool life, help reduce machining costs. And, Mr. Berger says: "Lehmann-Brandes products are precision-built. Gulfcut contributes greatly to the close-tolerance machining of components."

The complete line of Gulfcut cutting oils includes mineral-lard oils, sulfurized-mineral oils, sulfurized-mineral-lard oils, sulfo-chlorinated-lard oils and emulsifying oils. Each is scientifically compounded to meet specific needs—and the Gulfcut line includes a proper type of cutting oil *for every metal cutting need.*

Your Gulf Sales Engineer will be glad to recommend the correct Gulfcut cutting oils for you. He's at your nearest Gulf office, as close as your telephone.

GULF OIL CORPORATION
GULF REFINING COMPANY
1822 Gulf Building
Pittsburgh 30, Pennsylvania

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS



Where you can get...

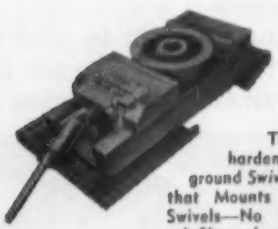
DOWN-HOLDING DEVICES *for any machine table or face plate*

J & S All-Purpose Jaw Clamps eliminate U-Clamps, Straps and Fingers for lathes, planers, milling machines, boring millers, jig borers, etc.

Faster Set-up with any of the 5 Models of J & S Jaw Clamps —one adjusting screw has a holding force of 2½ tons on the Small Model, to 12 tons on Jumbo Model for positioning and holding the work-piece.

Single powerful clamping action obtained from the 45° angle inward and downward movement of the jaw clamp is easily applied and controlled.

Compact, efficient design of J & S Jaw Clamps eliminates the usual obstruction problems—no interference with measuring tool readings.



The *only* hardened and ground *Swivel* Vise that Mounts Low—Swivels—No Pedestal. Shown here holding 8" diameter workpiece.

See your industrial distributor or write today for free literature.

J & S TOOL CO., INC. | DORSA AVE. LIVINGSTON, NEW JERSEY

CLAMPCUT

ROUND TABLE *Discussion*

BOW AND SCRAPE, OR STAND AND FIGHT

Should a foreman be willing to take orders from Engineering on such things as machining a new material? Or should he insist on full authority in his own department with consequent responsibility if something goes wrong?

ED IS NOT RIGHT in wanting full authority on anything, new or old. Engineering production today is such a complex venture, involving so much interdependence, that virtually no executive however highly placed can be accorded full authority in any aspect of his responsibility. Ed's boast, "I'll take the responsibility gladly but I want the authority to do it *my* way," indicates that he is supremely confident of his own ability. That is all to the good so far as it goes, but something more is needed.

Modern business demands cooperation and loyal obedience from all executives. Ed's view of what is required of a foreman today is strangely out of date. It seems to be the view of an old man who has not kept pace with modern thought and practice. There could be many reasons, unknown to Ed, why Engineering should make a recommendation concerning the feeds and speeds to be employed on the new aluminum alloy rings to be machined.

It is astonishing how many shop foremen, up in years, resent what they feel to be an infringement of their authority on status. Every progressive foreman will welcome all the help he can get. Such foremen are usually good organizers. The

"Forget about salary. Who runs the football pool?"

non-progressive ones are normally overworked because they overwork themselves in their anxiety to handle, exclusively, every conceivable responsibility concerning the running of their section.

Al's reminder that Engineering has got data from the mill concerning the new alloy should be enough to make Ed understand he cannot carry everything under his hat, even concerning machining, and that others have a contribution to make which must not be jettisoned by Ed simply because he is touchy about his dignity.

Al's attitude is the right and logical one. In a well-organized factory, neither Al nor Ed would have any say in a matter that is essentially part of company policy. The provision of an engineering section for advising the shops on engineering matters is a sensible arrangement, beneficial to all concerned, not excluding Ed. Ed is surely pulling a longbow when he insinuates he would be held to account for Engineering's mistakes. I doubt if he really believes that; few would. I rather think he is using the favorite Hitler trick of exaggeration.

If Al faithfully carries out an Engineering recommendation he need have no fear of a comeback for their mistakes, provided the recommendation is in the form of a note, as it should be. Ed's file would then keep him out of trouble. Where I am employed, there has been functioning for some years a department of research and development, staffed by trained engineers, chemists, metallurgists, etc, normally referred to as the backroom boys. The personnel of this department, R and D, for short, includes Doctors of Engineering, Whitworth Scholars, BS's, first class honors, down to BS's, ordinary. Those backroom boys cover every phase of the company's products and no manager or foreman need wrestle unaided with a problem.

Their services are available to all. Each member of the R&D is an authority on his own subject and if an on-the-spot investigation is called for, that is arranged. No backroom boy has authority over anyone in the works but it is an obligation on all to give them every facility and active cooperation. The arrangement works smoothly and frees works executives to concentrate on quality production. For smaller companies who cannot afford the whole cost of an R&D department, resources are pooled and a central district office serves the purpose for a wide area.

In the example cited by Ed, Engi-

Clearance Angle Scale — clearance angles are read directly from a graduated scale on the wheel spindle assembly.

Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel in correct relationship to self-registering tooth rests.

Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.

Here is a completely NEW method for grinding helical cutters...

It's name is

END MILL CENTRA-POINT GRINDER ®

It can save you time in sharpening

END MILLS
PLAIN MILLING CUTTERS
SHELL END MILLS
STAGGERED TOOTH CUTTERS
CHUCKING REAMERS
COUNTERBORES, ETC.

CENTRA-POINT'S new ball bearing carriage and workhead allow sensitive movement necessary for following helixes of small milling cutters.

Free folder tells the whole story

CENTRA-POINT DIVISION
William H. Field Co., Inc., 326 Dorchester Ave., Boston 27, Mass.

Please send the complete CENTRA-POINT story, at no obligation.

Name _____ *Title* _____
(Please print)
Company _____
Address _____
City _____ *Zone* _____ *State* _____

WHEELOCK, LOVEJOY & COMPANY, INC.
1250 Marquette Street, Cleveland Ohio

WHEELOCK, LOVEJOY & COMPANY, INC.
1855 So. Kilbourn Avenue, Chicago Illinois

WHEELOCK, LOVEJOY & COMPANY, INC.
265 Pennsylvania Avenue, Hillside New Jersey

WHEELOCK, LOVEJOY & COMPANY, INC.
12989 Greeley Avenue, Detroit Michigan

7 WAREHOUSES AT YOUR SERVICE

You'll get quick action on your order for alloy steel bars, billets or forgings . . . no matter what size, shape or heat treatment you require . . . when you call any one of our seven warehouses.

All seven are conveniently located in principal industrial areas. Each is staffed by expert metallurgists, and is well-stocked to give you speedy service.

Fill your current needs by ordering our own HY-TEN steels, the "standard steels of tomorrow", or standard AISI or SAE grades.

Or write today to our Cambridge office for your *free* Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

In Canada: Sanderson - Newbould, Ltd., Montreal and Toronto

WHEELOCK, LOVEJOY & COMPANY, INC.
144 Milton Street, Buffalo New York

WHEELOCK, LOVEJOY & COMPANY, INC.
4524 W. Mitchell Avenue, Cincinnati Ohio

HOME OFFICE:
WHEELOCK, LOVEJOY & COMPANY, INC.
137 Sidney Street, Cambridge 39 Massachusetts

neering would seem to have authority to make a recommendation an order, otherwise, Greaves would be unable to bring pressure to bear on Ed's immediate boss, Harrison. Ed is getting wound up about nothing and if he really believes he knows a better way he is going the wrong way about it. He is throwing away a golden opportunity to show his paces. He is really in verbal revolt against his chief, Harrison. The constructive way for Ed would be to put his proposals before Harrison instead of slating Engineering to Al. If he did this, in writing, he would have staked his claim and shown he had the courage of his convictions. No doubt, events would decide who had the right idea about how to machine the rings, Ed or Engineering. Ed certainly has no knowledge of finesse. No one is completely his own boss, except perhaps the tramp and he has the police to contend with.

C Donald
Lanarkshire, Scotland

NIGHT TIME'S FOR SLEEPING

Should the same shop rules be in force on the night shift as on the day shift? Can any more leniency be allowed, or should equal discipline be enforced for both?

WHEN rules are made they should be written down in black and white. If they are not written for everyone to see and understand we run into misinterpretation. Above all, the rules should be uniform both in the department and in the shifts.

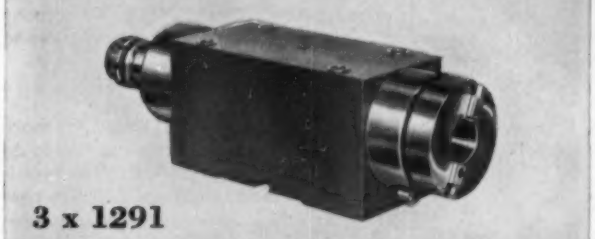
In this case an employee was sit-

"Uh, by the way, Ewald, it isn't necessary to enclose a box-top with your suggestions."

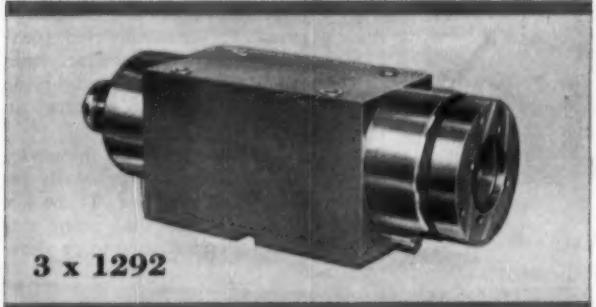
PARKER SPINDLES

FOR PRECISION BORING, MILLING AND GUN DRILLING APPLICATIONS

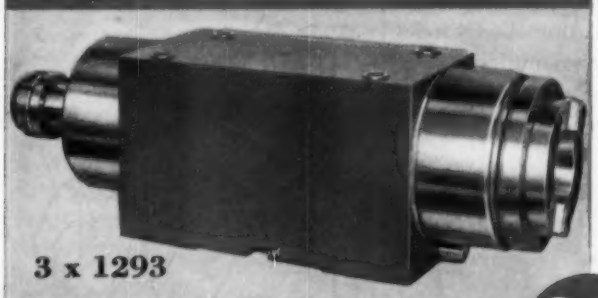
3 x 1290



3 x 1291



3 x 1292



3 x 1293

Versatile—Economical

NO BETTER REASON for the success of Parker-Majestic in the design and manufacture of machine tool equipment can be found than in the acceptance of its versatile 3x1290 series of standard boring, gun drilling and milling spindles.

●

FOUR BASIC BODY SIZES, with modifications of spindle shaft and bearing design, make possible more than 75 spindles, for almost any application in which spindles are used, with speed ranges from a few RPM up to 10,000.

●

YOUR CHOICE OF SHAFTS: 1. Flange head, no shaft hole; 2. Flange head, shaft hole with rear I.D. threaded for rotary coupling; and 3. Milling machine taper head with shaft hole for draw bar.

●

MILLING MACHINE TAPERS are No. 30, 40 or 50, depending upon size of spindle.

●

DESIGN STANDARDIZATION gives you advantages of economical prices, prompt delivery.

●

WRITE TODAY for complete information, giving application, material, finish required, amount of stock to be removed. Also send part print, if possible.

PARKER-MAJESTIC PM PRECISION MACHINES

147 Joseph Campau • Detroit 7, Michigan

AMES

Long Range Dial Indicators

Check Motions or Dimensions In .001" up to 10" Range.

Ames Long Range Dial Indicators in a variety of models are made for quality control applications requiring close tolerance and inspection. For example, you can measure in .001", long slide travel, large cams, deep recesses or other dimensions requiring indicator spindle travel of up to 10".

In addition, Ames Long Range models have all the advantages that are built into Ames regular indicators:—dials of large diameter; easy-to-read, widely spaced graduations; movable dials; replaceable contacts. All Ames Long Range indicators have count hands to indicate revolutions of the indicator hand. Those with box covered, rack guide have a slot in the cover graduated to register each inch of spindle movement.

Write today, sending your problem in long range measuring. Ames will be glad to suggest a solution. Be sure to include drawings and specifications – your answer will be back faster if you do.

Representatives in principal cities

B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

MANUFACTURER OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

ting down on the job although his machine was operating at the normal rate of production. Other employees were doing the same thing on other shifts. If this employee is to be fired, then other employees should also be discharged. This is the only way we can have uniform policies, procedures, and practices in the organization.

I remember my first job in management. I fired an employee for a very poor attendance record. Right away I had a grievance. Two other employees in another department had an equally bad record. Apparently this employee was a good quality production man.

Many employees who sit down between cuts can and do meet all requirements of a good job. This man's case was handled very poorly. He should have been given a warning or placed on a probation period. The discharge is questionable, and I doubt that it will hold up.

A E Salmons
Norristown, Penna

MEN ON a night shift don't get more pay because they are expected to do less work. The added incentive is given because they are asked to perform a task at an inconvenient time.

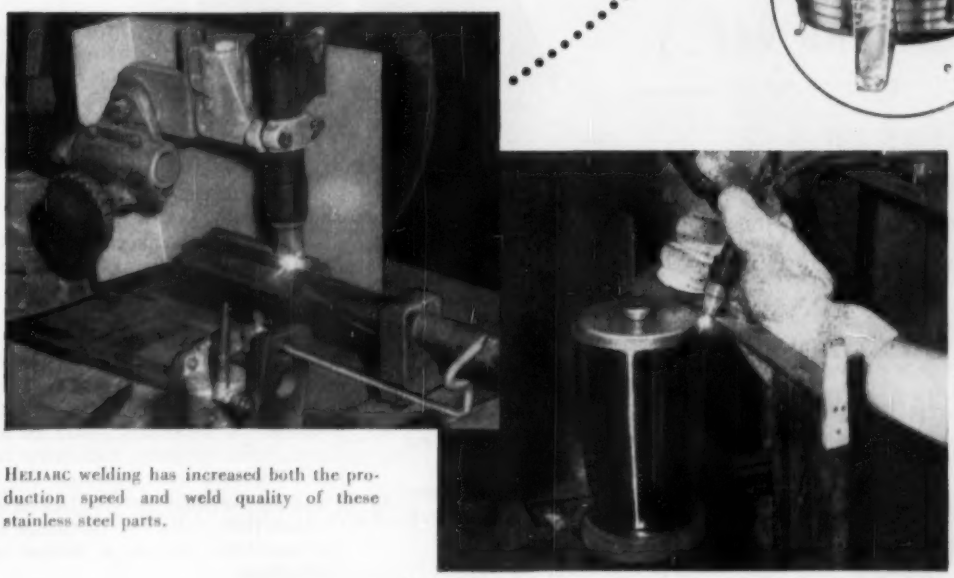
Generally, if the night owls are able to find a great deal of free time as a result of an accelerated technique, either their work suffers from hasty handling or they are given too much time in which to perform an operation.

To be more practical, however, working conditions are generally inferior after the sun sets. There are numerous instances that point this up. Drivers are cautioned to go slow-

"Getting even with the boss. I've invited him over for one of my wife's home-cooked meals!"

GAIN NEW SPEED AND WELD QUALITY

in light-gage metal fabricating



HELIARC welding has increased both the production speed and weld quality of these stainless steel parts.

Throughout industry, from production line operations to one-of-a-kind jobbing, HELIARC argon gas-shielded welding is helping fabricators gain new top weld-quality and production speed. These typical pictures show how HELIARC welding is used to efficiently fabricate sections of the Cory "Crown Jewel" percolator.

SETUPS DESIGNED TO FIT JOB NEEDS

These .031 in. type 302 stainless steel parts are fabricated in two fast, efficient operations. A mechanized HELIARC torch is used to butt weld a seam in the percolator's spout —and a stationary HELIARC torch welds the bottom section to the unit's body while parts rotate.

WELDING IS FAST, WELDS ARE SOUND

It takes only a few seconds to complete a 4½-in. long butt weld in the percolator spout. In the second HELIARC welding setup, a 17-in. circumferential weld on the percolator bottom is completed in only a fraction of a minute.

WIDE RANGE OF EQUIPMENT AND APPLICATIONS

HELIARC welding setups are available for manual, semi-automatic, and automatic operations. All are ideal for a wide range of light-gage metal jobs. Call your local LINDE representative and find out which HELIARC welding apparatus is best suited for your fabricating needs. Start saving now—call today.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

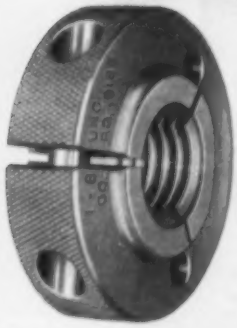
In Canada: LINDE AIR PRODUCTS COMPANY

Division of Union Carbide Canada Limited, Toronto

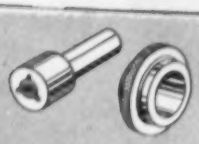
"Heliarc" and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

Shortest Route to Quality Control is via PRATT & WHITNEY



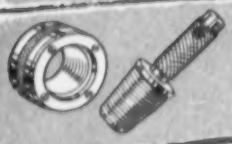
THREAD GAGES



Cylindrical GAGES

TAPER GAGES

ROLL THREAD SNAP GAGES
Adjustable Limit Snap Gages



Oil Country GAGES

RAILROAD GAGES

PRECISION END MEASURES

Precision GAGE BLOCKS

shortest route . . .

because Pratt & Whitney manufactures *complete* lines of conventional hand gages. You can select — from just one source — *all* the types and models you need to establish efficient quality control methods in your plant. A few of the many available are shown here.

surest route . . .

because into every Pratt & Whitney Gage is built an unmatched quality and accuracy that insures higher standards of precision maintained with complete dependability.

start off now

on the right foot — write now for descriptive literature on the P&W Gage types you need. And if you want expert help in selecting the best gages for your specific requirements, call in a Pratt & Whitney Gage Specialist . . . there's one conveniently located in your area.

PRATT & WHITNEY COMPANY
INCORPORATED
11 Charter Oak Boulevard, West Hartford 1, Connecticut
Branch Offices and Stocks in Principal Cities
MACHINE TOOLS • GAGES • CUTTING TOOLS

er in the evening because vision is impaired. Daylight is preferred for reading jobs because it is more healthful. Psychologically, sunshine enhances an atmosphere and tends to create a brighter outlook on a working situation. Industrial dining facilities are practically non-existent when the night shift eats, which means that it lacks the advantage of a complete change during the eight on-the-job hours.

Consequently, rather than loosen their reins, late workers ought to be more cautious about their working habits.

Joseph McLaughlin
Rockaway Beach, NY

MEN and women who work the night shift are mature, practical people. They neither want nor expect coddling because they live in an upside-down world. When applying for the job they exercised a free choice as to whether or not to forego the normalcy of daytime work for the additional compensation offered by the night shift. Special favors and relaxed supervision are unwanted rewards for the preferment in selecting how one makes one's livelihood.

For various reasons pertaining to their personal lives these people want the upside-downness because it affords more daylight hours for hobbies, home projects, and being with and enjoying their families. The additional earnings provide the income which they could not command in a comparable job on a regular day schedule.

What then are the grievances of

"How come you can quote lifetime batting averages of both leagues but you can't remember your slide rule figures?"

SUNNEN HONED HOLES—PRECISION GUARANTEED

Sunnen Honing Machines are GUARANTEED to hold specified tolerances on *all four* hole dimensions:

- DIAMETER TOLERANCE • GEOMETRIC ROUNDNESS
- GEOMETRIC STRAIGHTNESS • SURFACE FINISH

Sunnen field engineers WILL NOT recommend Sunnen Honing equipment for your purpose unless it can live up to this guarantee.

They will help solve your hole production problem . . . and train your personnel to operate the machine, without charge.

TODAY'S TOLERANCES AND FINISHES CALL FOR HONING

5
FREE BOOKLETS

They show how honing may solve your hole production problem.

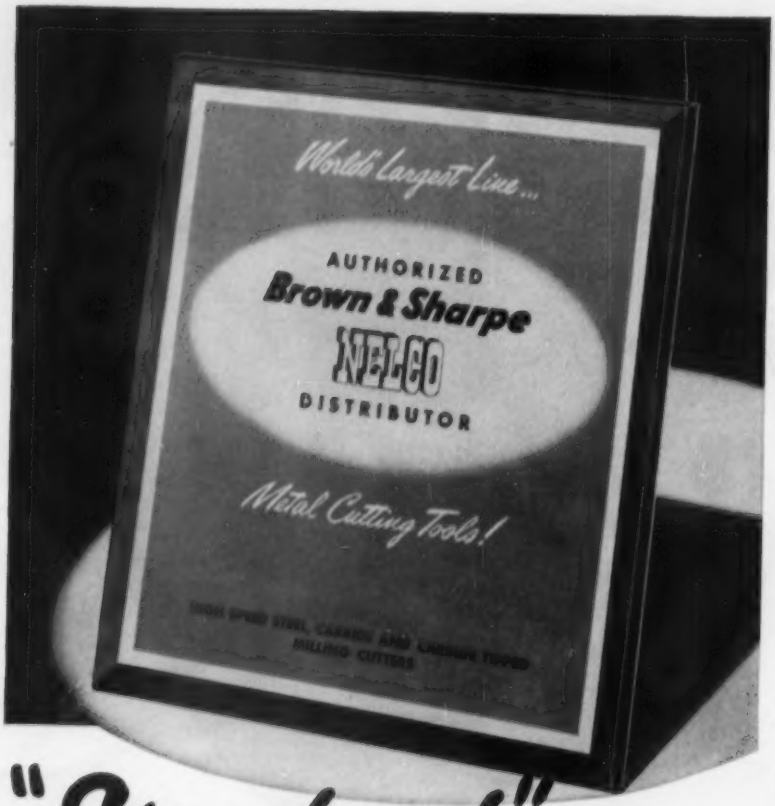
tear out coupon now!

7100

SUNNEN
PRODUCTS COMPANY
7982 MANCHESTER AVE. • ST. LOUIS 17, MO.

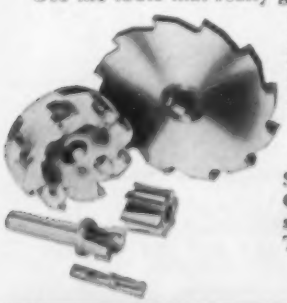
☐ Send five free booklets.
☐ Have field engineer call for free demonstration.

NAME _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____



"Standard" MILLING
CUTTERS BY THE THOUSANDS!
... from stock—through your
Brown & Sharpe—NELCO distributor!

Brown & Sharpe - NELCO—manufacturing over 3000 Carbide, Carbide Tipped and High Speed Steel milling cutters and accessories—stand behind the distributor displaying this plaque.
You can rely on him to save you days and dollars with superior tools, superior service!
Use the tools that really give you a COMPLETE selection . . . a speedy solution to all your cutter problems—over 3000 "standards" are as near as your phone. Switch to the most complete source! See the Brown & Sharpe-NELCO Distributor in your area . . . today!



SEND for the New Nelco Catalog just off the press, showing over 700 Carbide Tipped Cutting Tools.

NELCO TOOLS
For that EXTRA Edge in Production!
NELCO TOOL COMPANY, INC. • MANCHESTER, CONNECTICUT

the night shift? Are they the peevishness of misfits, or legitimate gripes of the misunderstood night owl whose wants and needs are just as real as those of his day-shift counterpart?

The man reporting for work at 8 AM feels the newness of each day with a fresh approach to his job as he incorporates new ideas, applies new regulations, or wrestles with new assignments. Using his initiative, testing his ingenuity, and straining imagination, he quits at 4 o'clock and, in his opinion, he's had a tough day. His one thought now is to join his car pool and race for home.

But hasn't he forgotten something? Did he remember to leave new instructions and report that a machine was out of adjustment, or will the night man take the rap for resulting wasted material? In his hurry to close up shop has he left disorder, forgetting that the night man will have to clean it up before he can begin his job? Did he remember to spark the competitive spirit with reminders of new ideas for bettering the output, or will he carelessly blame the night shift for lagging production? In short, is he helping to create a sense of "newness" in the night shift's dark night of day or does he consider these people slightly screw-ball, and not likely to know the difference?

Better understanding and thoughtful cooperation could well be the only "favor" necessary to bridge the difference between night and day.

Evelyn S Mulligan
Westbury, NY

SNOOPER BY APPOINTMENT

Is a production man liable to uncover safety hazards in the shop if he is delegated to be an inspector for a day? Will such a system make workers more conscious of safety, or is it a waste of time?

ACCIDENT hazards by their very nature are situations that take people by surprise. Therefore, it isn't good sense to appoint an untrained hand to investigate such matters. To begin with, a person who goes off poking his nose into strange territory is more likely to become an accident victim than a careless worker because a stranger in an area is ignorant of many pitfalls.

In industry we give credit for experience. A man who performs a job several times a year would hardly have a suitable background to do

his work well. Furthermore, the short duration of his assignment would be little incentive to place any great effort into it.

Safety is too important an aspect of daily living to be treated in a haphazard manner by a carelessly organized force.

Perry G Conway
Philadelphia, Penna

THE IDEA of having an operator with a below-average safety record take a day off to look for accident hazards is quite original, but to my mind—and I have no doubt to many of his shopmates—it looks like a bonus for disregarding the safety rules that his fellow workers live by day in and day out.

Frankly, I don't believe this type of individual has what it takes to evaluate a safety hazard if we are to judge by past performance, and one can't blame his fellow workers for being more than a little irked if they see this "dangerous Dan McGrew" snooping around with paper and pencil while they are sweating it out on the production line. I am afraid some blood pressures will climb and unprintable comments will be aired regarding Al and his "inspector-at-large" that will send shop morale down several points.

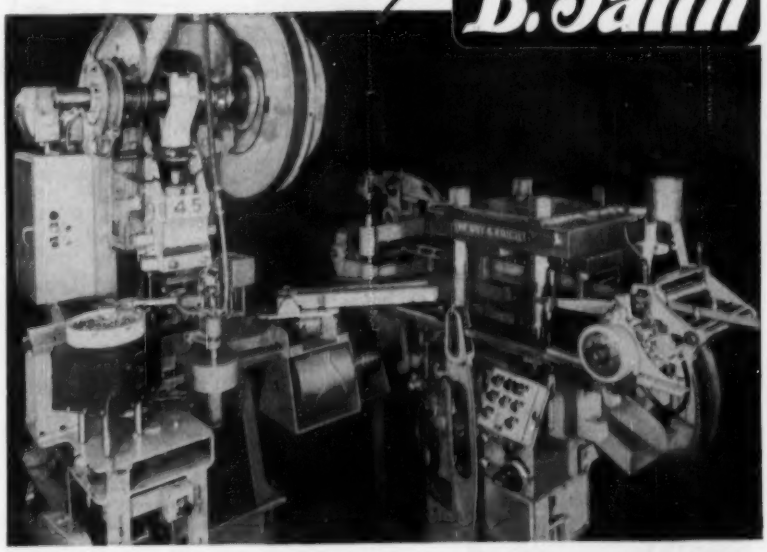
If Al is really serious about getting at the causes of shop accidents, he would be better off forming a committee of his more safety-conscious employees and really get to work on the problem.

In one shop where I worked, four men were chosen every month as a shop safety committee. One of their number took one hour off each week

"Thith plathe ith getting under my thkin!"

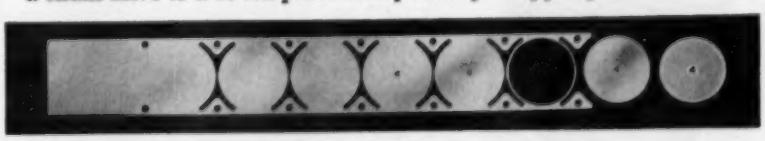
2 PRESSES . . . 1 PROGRESSIVE DIE . . . 1 STIPPLING DIE . . . ENGINEERING INGENUITY . . . SPECIAL MACHINERY . . . SPECIAL ELECTRICAL COMPONENTS . . .

produce
AUTOMATION
by **B. Jahn**



Here's true automation — 100% automatic production, 100% B. Jahn built, that transforms .025" aluminum into precise meter components 3⅝" in diameter — each with 720 teeth .009" deep — without human hands, human error!

Equipped with B. Jahn progressive die, one 60 ton press was linked by a chain drive to a 45 ton press incorporating a stippling die.



Progressive die, ground all over to guarantee greater accuracy, longer service, less downtime, pierces and blanks intricate discs.

Conveyor system feeds disc into air-operated vacuum arm that positions piece in B. Jahn stippling die. Another arm removes stippled piece and places it on stacking unit.

Completed discs, at the rate of 30 per minute, are automatically stacked and spaced on spindle.

Here's true AUTOMATION, true production economy!

Get Full Details On This Astounding "No Hands . . . No Delay . . . No Error" Automation Application — Send Today for the Big New B. Jahn Brochure.

B. Jahn

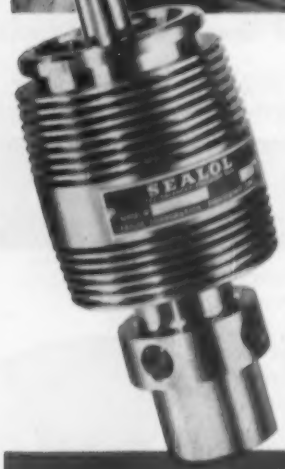
THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Now DRILL PRECISION HOLES IN 1 PASS

ON YOUR DRILL PRESS OR LATHE

with Sealol's

DRILL ADAPTOR



Whether you drill deep or shallow . . . your present drilling equipment is quickly and economically adapted for **precision gun drilling** with Sealol's Drill Adaptor —

Gun Drilling produces **straight** holes with feeds greater than 11 ipm — tolerances held to less than .0005 in. — wall finishes smoother than 8-10 rms . . . **all in one operation!**

Here's How It Works: The Drill Adaptor is designed for direct attachment to vertical or horizontal drilling equipment. It is installed (or removed) in a few minutes.

The Drill Adaptor transfers coolants at rotational speeds to 10,000 rpm . . . at pressures to 1,000 psi.

Regardless of the depth of hole, coolant is delivered right at the cutting edge. Drills always run cool, chips are continuously flushed out.

Actual Production Records Prove

- You save money.
- You get longer tool life, fewer rejects, greater output.

Find Out More about Sealol's Drill Adaptor . . . how easy it is to install, how it can improve drilling performance in your shop. Send for Bulletin No. 12.

SEALOL

Mail This Coupon Now

DEPT. H, WARWICK INDUSTRIAL PARK, PROVIDENCE 5, R. I.
Please send me Bulletin No. 12 on Sealol's DRILL ADAPTORS for use in precision gun drilling.

Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....

for shop safety inspection and reported to his fellow committeemen at a one-hour meeting held every Friday, with the foreman presiding. Any recommendations he had to make were talked over by the committee, and if found satisfactory were turned over to the foreman for action. As a new committee was formed each month, every man in the shop had a chance to serve, and the question of favoritism could not be raised. At the end of each quarter the safety suggestions were evaluated and the one that was voted most constructive won an award, which took the form of one day off with pay for the suggestor. Needless to say the added incentive sparked some really worthwhile suggestions and the level of safety in that shop rose appreciably.

In this particular instance the slogan that "Safety is everybody's business" took on a new meaning for the simple reason that every man had a chance to take an active part in accident prevention. I am convinced that Al would do better to adopt such a plan rather than the dubious idea that forms the theme of this discussion.

Robert S Alexander
Glastonbury, Conn

TO HAVE one of the men spend a day looking around for trouble may be all right and then again it may cause more grief than the good to come of it. To be sure it will awaken him to a feeling of safety consciousness even though he accomplishes nothing else. One thing is certain, it will inflate his ego sufficiently to make him feel that his ability is at last recognized as being good for something else besides being tied down to a machine

"The management has set this lathe aside for you men to use on your home projects."

RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities
By John S. Davey

Tighten bolts to yield strength?

Actually, it is safer to "overtighten" than to undertighten. The following explains why.

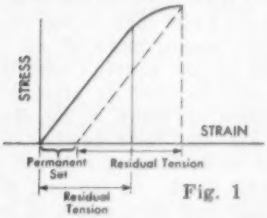


Fig. 1

Up to yield point, the strain in a bolt is proportional to stress. *Beyond* the elastic limit, the bolt goes into its "plastic range". Some permanent stretch takes place. (Fig. 1). Yet while the bolt will not return to original length, note that *residual tension* is fully maintained. And remember, it's *this* force that keeps a bolt tight, determines joint strength.

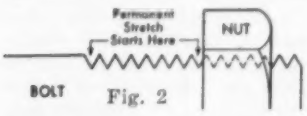
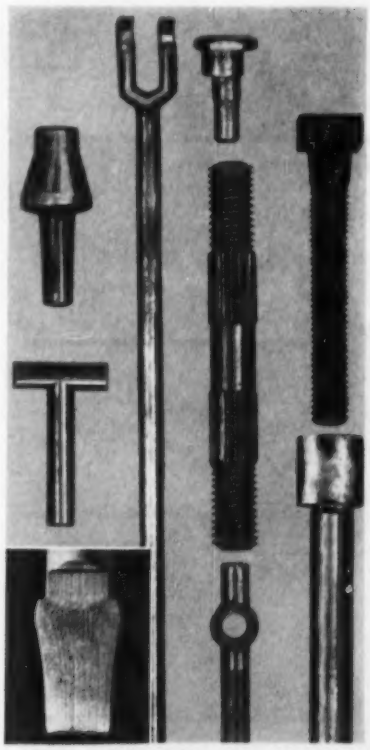


Fig. 2

The permanent set starts at section with highest unit stress —which is at the unengaged threads (Fig. 2). Ultimately, this throws thread pitch off and nut locks, subjecting bolt to torsion (rather than further tightening). This force disappears with wrench-removal. Thus, a bolt can even be torqued well into its plastic range if it won't be reused or need adjustment.

Cold facts on cold headed fasteners



RB&W cold heading machines have forced metal to flow into this typical variety of shaped pieces—just a handful of thousands of different cold headed shapes produced by RB&W to specification. The upset can be at any point, and the shape need not be symmetrical. The continuous, symmetrical flow lines (inset) make metal stronger.

NO ATTEMPT to simplify, improve or economize on fastening is complete without a good look at your screw machine parts, forgings, and certain assemblies that can be reduced to one piece.

You would be surprised at what an expert can produce on cold headers with complete uniformity. Cold heading produces in one piece parts that would otherwise be two or more.

BETTER FLOW LINES

Just as it does with standard fasteners, cold heading makes possible a higher quality, stronger product at high speed and low cost. Properly done, the operation upsets metal along its own axis in continuous flow lines without folds. Stress patterns are better. Fasteners and parts gain greater shear, impact and fatigue strength.

Long a specialist in cold headed fasteners, RB&W offers its experience to designers and production men who want to know whether cold heading is feasible for specific mechanical shapes. If it proves to be so, RB&W facilities can handle your volume needs. Contact Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. **Additional sales offices at:** Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Spin-Lock® Screws solve assembly problem

The designer specified countersunk-head screws to be used in a particular casting. The production man had to stake these in to anchor them. But this meant extra operation, made screw removal damaging and difficult.

The answer was found in Spin-Lock screws. These have hardened "ratchet-action" teeth that bite in when tightened, take 20% more torque to loosen than to tighten, can be reused. Send for Bulletin.

Spin-Lock "tooth" about to bite in Head meets seat when fully tightened.

Priced Under Cemented Carbides

DIAMONITE OXIDE CUTTING TOOLS

Multiply Production of Machine Tools

Because Diamonite is the hardest, most abrasion-resistant material ever developed for tool service

. . . . . is itself an oxide . . . can't oxidize or "burn up"

. . . . . is chemically inert to surface welding

. . . . . the vitreous non-metallic Diamonite bond withstands higher temperatures and pressures than any other type of bond . . .

Diamonite Oxide Cutting Tools perform successfully at high speeds impossible with other materials.

This is evidenced by results of field tests on actual production operations.

184% INCREASE ON A.I.S.I. 1035
Part: 20" Face of Aircraft Part
Material: A.I.S.I. 1035

	Carbide	Diamonite
Speed, f. p. m.	235	840
Feed, i. p. r.	.033	.016
Depth of cut	.125"	.205"

700% INCREASE ON A.I.S.I. 4145
Part: 1¼"x22" Spindle
Material: A.I.S.I. 4145 H.R. and Annealed

	Carbide	Diamonite
Speed, f. p. m.	700	1400
Feed, i. p. r.	.003	.012
Depth of cut	⅛"	⅛"

150% INCREASE ON A.I.S.I. 1045
Part: 5½" Shaft
Material: Hot Rolled A.I.S.I. 1045

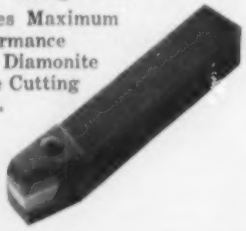
	Carbide	Diamonite
Speed, f. p. m.	250	628
Feed, i. p. r.	.016	.016
Depth of cut	¼"	¼"

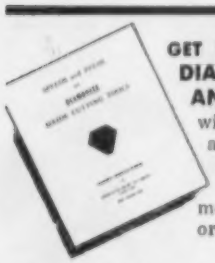
230% INCREASE ON S-7720 STAINLESS
Part: 2" Stainless Shaft
Material: S-7720 Stainless

	Carbide	Diamonite
Speed, f. p. m.	126	390
Feed, i. p. r.	.007	.015
Depth of cut	¼"	⅛"

ANOTHER DIAMONITE FIRST
DIAMONITE
New Superigid
TOOL HOLDER
Especially designed for use with oxide cutting tools.

Insures Maximum Performance from Diamonite Oxide Cutting Tools.





GET THIS NEW DIAMONITE SPEED AND FEED CHART
with recommended speeds and feeds for use with Diamonite Oxide Cutting Tools. Ask your Diamonite Tool distributor—or write

DIAMONITE products manufacturing company
Canton 2, Ohio

all day long. We have to be cautious in doing this as there is the possibility of wrecking a good machine hand to such an extent that he will grow dissatisfied with his regular work.

There is one great danger to Al's scheme in that certain individuals are not emotionally equipped with the proper safety valve and their inflation may not stop where it should. I've seen this happen to my own regret where a man was given an opportunity beyond his regular course of work and, instead of it stopping where it should, it started a chain reaction resulting in transforming him into an entirely new personality which wrecked the old one to such an extent that he was no damn good at all on his old job. I delegated a certain character to spend a day around the plant to see what he could improve upon. This bird decided that everything was wrong and he even spent a good deal of his time making a study of me and where I could improve. Not that I couldn't stand some improvement, but I hadn't intended giving him a match to set off the whole powder keg! I thanked him for his ideas and the next day he was back at his machine but from then on he was a ruined man. From then on his emotional gear was stripped of all its teeth and he just couldn't take the change back to operator after getting a taste of being a big shot. Finally the ego juice reached his head and he decided to pull out to more fertile fields. As far as I can tell he may now be a power in the field of production as the result of the boost I may have given him—that is a possibility.

This evidently is an exceptional case and we shouldn't be unduly influenced. However, one should exercise discretion in selection for such "snooping around" jobs if he doesn't want to ruin a good, satisfied operator.

There is no doubt that an individ-

ual who is careless will reap a certain amount of benefit by being assigned to the job of looking around for safety suggestions. Then again it will do no harm to instill in the workers that safety consciousness so necessary for the efficiency of the production shop. Al, you'll just have to use your head and do your own looking around unless you want to ruin a good operator by taking such a chance. It's a gamble, so make sure you pick the right horse.

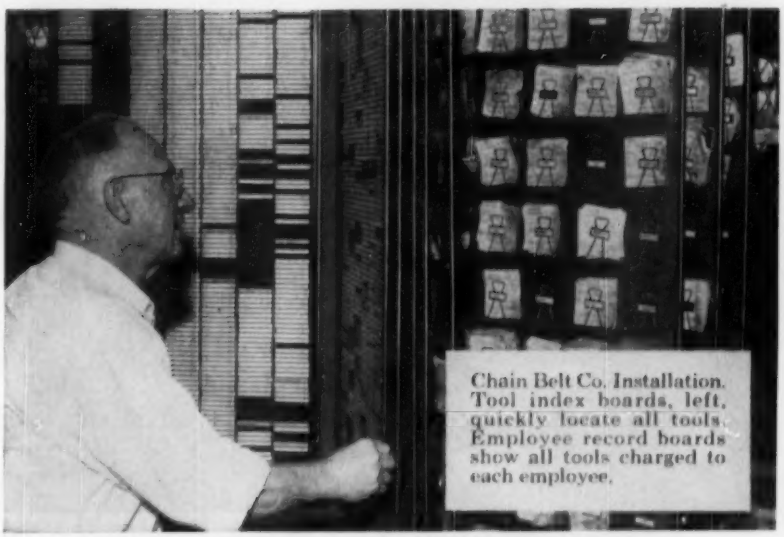
Jack Everett
San Francisco, Calif

IT DOES not seem to be a very sound idea to give a production worker a day off to look for safety hazards in the shop, particularly if the worker is accident prone, as stated in the example. The fact that the worker is always having accidents indicates clearly that he cannot recognize a hazard when he is confronted with one.

Even if the man saw some setups which would lead to accidents, he might fail to mention them for fear of bringing ridicule on himself. One reason why certain types of individuals are always suffering accidents is due to a distorted idea about bravery; the safety-minded worker who is always careful to avoid a dangerous situation is a sissy in the eyes of the rash and accident-prone man.

The type of safety hazard snooper needed is one who never has an accident, because his past accident-free record indicates that he is aware of danger and can foresee the possibilities of a dangerous situation. It takes a good deal of intelligence and imagination to spot possible sources of accident in a factory and the man who is always in trouble is not usually gifted with a high degree of intelligence or imagination. Anyone who studies accident records and investigates the details which lead to them is constantly amazed at the ingenious ways in which workers will get themselves into trouble.

Accident-prone workers are often led into danger because of their desire to show off. One shocking and spectacular practice shown recently in a film issued by an engineering organization as sales propaganda showed the operator of a boring mill treading the revolving table so that he stayed in one place. This was very dramatic from the viewpoint of those who made the film but it raised a feeling of horror in the



Chain Belt Co. Installation. Tool index boards, left, quickly locate all tools. Employee record boards show all tools charged to each employee.

CHAIN BELT COMPANY OF MILWAUKEE REPORTS

"We couldn't get along without our McCaskey Tool Crib Control"

Twenty years of service for Chain Belt Company of Milwaukee has proved McCaskey Tool Crib Control is an indispensable part of any tool crib operation. Experience has shown that the small initial investment is often returned many times within the first year of use, and that annual savings can amount to thousands of dollars.

McCaskey tool accountability cabinets in Chain Belt Company tool crib.

Here are just a few ways McCaskey Tool Crib Control has saved money for Chain Belt Company and will save money for you:

(1) Keeps tool inventory in the crib at a minimum, reducing monthly purchases.

(2) Prevents accumulation of idle tools at machines or benches.

(3) Reduces tool breakage by identifying source of breakage.

(4) Reduces loss and misplacement.

(5) Eliminates slow crib service, reduces non-productive time of employees and machines.

And, the McCaskey System does all this and more without additional crib personnel. McCaskey Systems are completely flexible—there is a set-up for your plant regardless of size or products. Find out how you can cut your tool expense . . . mail the coupon today.

McCASKEY INDUSTRIAL CONTROLS
Production • Inventory • Tools • Maintenance • Costs
Division of
VICTOR ADDING MACHINE CO.
3900 N. ROCKWELL STREET • CHICAGO 18, ILLINOIS

VICTOR-McCASKEY LIMITED,
GALT, ONTARIO

Manufacturers of Business Machines Cash Registers, Business and Industrial Systems, Electronic Equipment, Electri-Cars.

Victor Adding Machine Company
McCASKEY INDUSTRIAL DIV., Dept. AM-1256
3900 North Rockwell Street, Chicago 18, Ill.

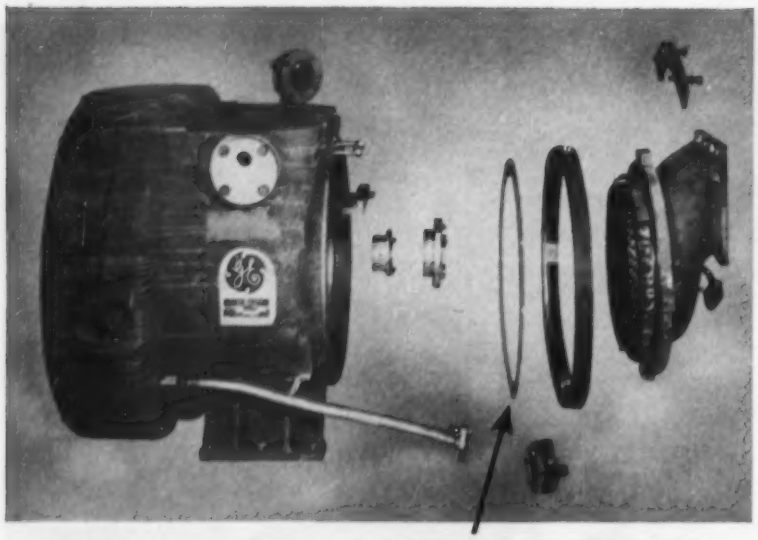
Please send me your new booklet, "How Tool Costs Were Cut 12 Ways in 20 Plant.."

Name_____

Position_____

Company_____

Address_____



LAMINUM® adjustable SHIMS

cut assembly costs on turbo-supercharger for diesel engines

THIS is only one from thousands of laminated shim applications throughout all industry. Yet the reason for using laminated shims and the gains resulting are typical. This shim sets the clearance between the nozzle and buckets on the General Electric RD3C turbo-supercharger. Shimming is essential because of the accumulation of tolerances. The laminated shim can be adjusted quickly merely by peeling—and after peeling is always precisely uniform in thickness from end to end and side to side. Peeling is far easier and faster than precision grinding which would prove quite costly on these extremely large shims.

Whenever you need shims, call the Laminated Shim Company *first*...for fast, complete service. We manufacture shims in aluminum, brass, steel—small as a fingernail and large enough for locomotives...laminated, spot-soldered or looseleaf. Produced to your own precise blueprint specifications.

For further information and free booklet telling all about laminated shims and how they're used, please write. No cost or obligation, of course. Write today!

SHIM HEADQUARTERS SINCE 1913

LAMINATED SHIM COMPANY, INC.

The name Laminum is registered with U. S. Patent Office

3112 UNION STREET, GLENBROOK, CONN.

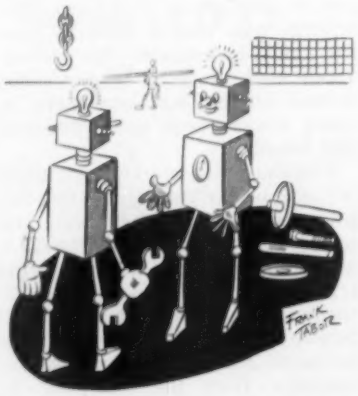
LAMINATED SHIMS OF LAMINUM® AVAILABLE IN BRASS • STEEL • STAINLESS STEEL • ALUMINUM

minds of many engineers who saw the film. It was a very bad advertisement for the firm concerned.

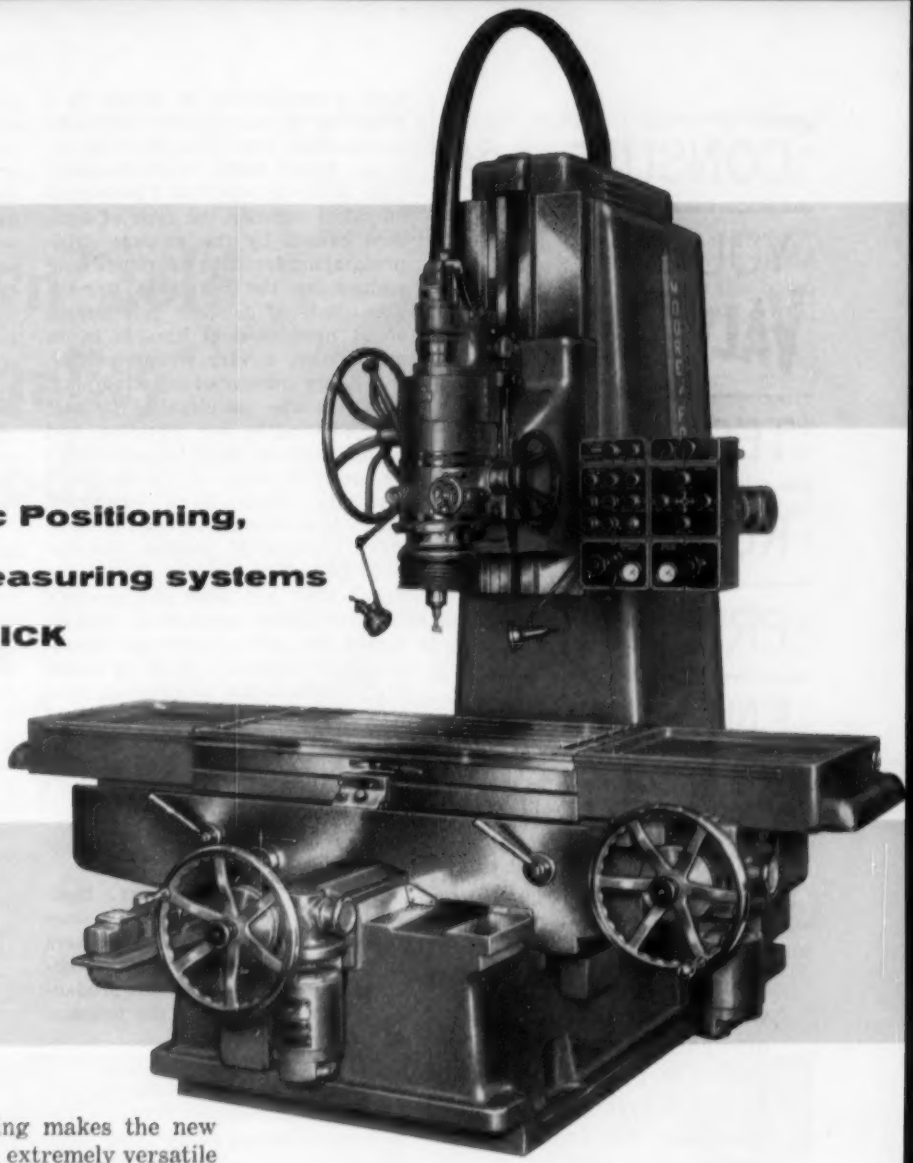
Every engineering journal publishes articles dealing with safety and it is noteworthy that most of these articles deal with propaganda methods and the over-all organization of a safety department. I personally have not yet seen any posters or other matter which brought home to the workers in a convincing manner the various ways in which accidents can happen. We are all familiar with the value of keeping gangways clear and wearing goggles when grinding and performing other machining operations, but nothing is ever done to publicize the unusual accident which can arise from equipment which is apparently safe.

Another defect of the average article on safety is the lack of detail about the causes of accidents. There should be many more actual cases described and the methods used to overcome repetitions of the accident. For example, it is useless to say that a workman on a planing machine was trapped between the top of the job on the table and the bridge of the machine when the start button was accidentally depressed while the operator was standing on the machine table. Readers want to know what he was doing there in the first place, how the button came to be pressed, and what steps have been taken to prevent it from happening again.

There is a lot of material published about the safe-guarding of drilling machines and many designs of guards which enclose the drill and the chuck have been evolved for sale commercially. Speaking as a practicing engineer, I am completely at a loss to understand what



"Gloves are too expensive. I had the welding department hard-surface my hands."



NOW...Automatic Positioning, choice of two measuring systems on MOORE-FOSDICK Jig Grinder!

Exclusive automatic positioning makes the new Moore-Fosdick Jig Grinder an extremely versatile machine! Besides large work capacity (22″ x 44″ or 18″ x 36″ x 27″ height) you get increased speed and precision. At the touch of a button, table and saddle position automatically to ± .0001″!

A choice of two precision measuring systems is available. With the new and exclusive Direct Dimension Measuring, dimensions from blueprint are simply set on direct-reading drum dials. The other system, Rod and Bar Measuring, employs measuring rods, micrometers, and for high production work, duplicating bars. Either measuring system may be installed with or without automatic positioning, but both systems cannot be installed on the same machine.

On the Moore-Fosdick Jig Grinder you can grind conical holes with taper in either direction, as well as cylindrical holes. An angular and indexing device built into the main spindle, and the recently developed slot grinding attachment, give quick, accurate grinding of any contour — *regular or irregular*. Write for price and delivery information.

Other outstanding features include: infinite range of grinding speeds—12,000 to 60,000 rpm, contour and chop grinding, spindle-housing heat control.

NEED JIG GRINDING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

CONSULT
YOUR
VALVOLINE
TECTYL
RUST
PREVENTIVE
ENGINEER

Your individual rust problems are completely diagnosed by a qualified Valvoline Tectyl Rust Preventive engineer . . . who will make immediate recommendations or turn your rust problem over to the Tectyl research laboratory for complete analysis . . . all at no cost to you.

SEND CONVENIENT COUPON TODAY FOR COMPLETE INFORMATION BOOKLET

TECTYL RUST PREVENTIVES
VALVOLINE OIL COMPANY
(Div. of Ashland Oil & Refining Company)
FREEDOM, PENNSYLVANIA

Please rush my copy of your newest booklet entitled, "The Key to Rust Prevention," which tells about the problems of rust, cleaning my products, materials in corrosion preventives and how to choose a rust preventive.

Name .....
Firm Name .....
Address .....
City ..... Zone ..... State .....
AM-12-57

kind of accident can be caused by a revolving twist drill, but I am ready to be convinced that injuries do arise from them. Unfortunately, none of the articles that I have read on safety mention the type of accident caused by the average drill-press, apart from the operator being scalped by the revolving spindle. This lack of specific information about machine-shop hazards is, in my opinion, a very serious matter.

A safety snooper of any kind must be a man who can visualize the hazards existing in any situation, and his imagination must be augmented by plenty of study of the causes of accidents which have happened. There is a strong case for the technical journals to publish descriptions of safety devices in greater detail than has been the practice hitherto. Safety propaganda must be a good deal more graphic and bloodthirsty, if necessary. A lot of safety propaganda seems to have got into a rut from which it should be jerked with considerable force.

Clifford T Bower
London, England

LOAN SHARK

Is it or is it not the foreman's business if one of the men in the shop is lending money to other workers and charging interest? If the borrowers are not complaining, and production is not affected, has the foreman any right to interfere?

SOMEONE has said that the world's greatest humorist was probably the man who named them "easy payments."

A foreman has no right to quibble with company policy on usurers when federal legislators have gone to the trouble of outlawing them and the Bible repeatedly condemns the practice of the illegal use of money. When rules are so universal, no one should assume that he can take it upon himself to make an exception to the procedure.

If Al is genuinely interested in giving his men a break, he might speak to the loan shark personally to confirm the rumor and attempt to put a stop to the practice. If for no other reason, he should object on the grounds that the men are using company time to attend to personal matters.

Alternatively, he might distribute information concerning sources where the men could borrow money at cheaper rates. It is true that places where the best rates are obtained will not deal with all applicants. However, there are recognized loan companies that will make few exceptions when they cater to the public. Their rate of interest is greater than that of most banks but people with whom they refuse to deal are poor unfortunates who already are assuming more responsibilities than they could ever meet.

Let us stop encouraging people to live within their means by borrowing the money to do so.

C McLaughlin
Rockaway Beach, NY

IT IS TO management's advantage to make living conditions as ideal as possible for the general staff of workers.

Personal problems are not easily

"Some clown locked the door!"

Youngstown "cold heading quality" wire and rods

. . . provide high fastener production at National Screw & Manufacturing Co.

CLEVELAND'S National Screw & Manufacturing Company is widely known for the quality and dependability of their complete line of fasteners. To maintain continuous product quality and provide high production, they rely on Youngstown Cold Heading Quality Wire and Rods as the basic material for many of their fabrication processes.

Youngstown Wire & Rods are internally sound, uniform in both physical structure and chemical composition—as well as free from injurious seams and slivers. That's because they are quality controlled through all Youngstown's integrated operations from ore mining to finish product.

Furthermore, Youngstown's Cold Heading Quality Wire is supplied with a tight "Nogald" or "Extrudo" coating that provides the necessary lubrication to prevent galling and undesirable die wear. It feeds smoothly through cold headers giving steady high production right around the clock. No wonder satisfied users report: "Our production's increasing—Rejects falling—Profits up." Why not make it **your** specification?

Call or write your nearest Youngstown District Sales Office for additional information on metallurgical assistance.

THIS MODERN SOLID DIE DOUBLE LONG-STROKE COLD HEADING MACHINE AT NATIONAL SCREW PRODUCES HIGH CARBON HEX-HEAD CAP SCREWS UP TO ½ INCH DIAMETER, BY 6 INCHES LONG WITH ONLY TWO STROKES OF ITS HAMMER. USING 2800 POUNDS OF WIRE, IT DELIVERS APPROXIMATELY 4900 PIECES PER HOUR.

QUALITY · YOUNGSTOWN · SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

District Sales Offices in Principal Cities

Look to Wyckoff—when you require cold finished steel with special characteristics. Wyckoff offers to you its facilities for specialized furnace treated, and/or quenched and tempered cold finished steels to *your* specifications.

Make WYCKOFF your headquarters for your cold finished steel requirements.

WYCKOFF
COLD FINISHED STEELS

PRODUCTS
CARBON, ALLOY AND LEADED STEELS
TURNED AND POLISHED SHAFTING
TURNED AND GROUND SHAFTING
WIDE FLATS UP TO 14"
ALL TYPES OF FURNACE TREATED STEELS

WYCKOFF STEEL COMPANY
GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
Branch Offices in Principal Cities
Works: Ambridge, Pa.—Chicago, Ill., Newark, N.J.—Putnam, Conn.

left at the gate before a man comes to work. Providing a temporary, short-cut solution, on the job, will only aggravate the condition in the long run. The cost is greater and, consequently, the worry is magnified. This situation is bound to reflect on a man's handling of his assignment.

A loan shark exerts undue pressure on men from several vantage points. Once a person has succumbed to the easy-come, easy-go method of replenishing his funds, his resistance is lowered. He can be compared to a monkey eating peanuts—the more he gets, the more he wants, without giving a thought to the consequences. When the other monkeys see, they do, even though it had never before occurred to them to try the wares of the peddler. As a result, in a loan-shark area, debts become a common bond of the workers rather than stability in an atmosphere of harmony.

Neal A Mack
Belle Harbor, NY

MILLS is a financial wizard, a loan shark charging ten per cent interest per week for the loan of money to his fellow workers. Mills is an enterpriser satisfying a demand for a service needed badly by some members of society. Yet Mills is not working in the best interests of all concerned, the worker, his employer, and the community.

Put Mills out of business. Tell him to operate on his own time and outside of company property. Do more than this. Establish means for satisfying the need of employees now being filled by Mr Mills' operations.

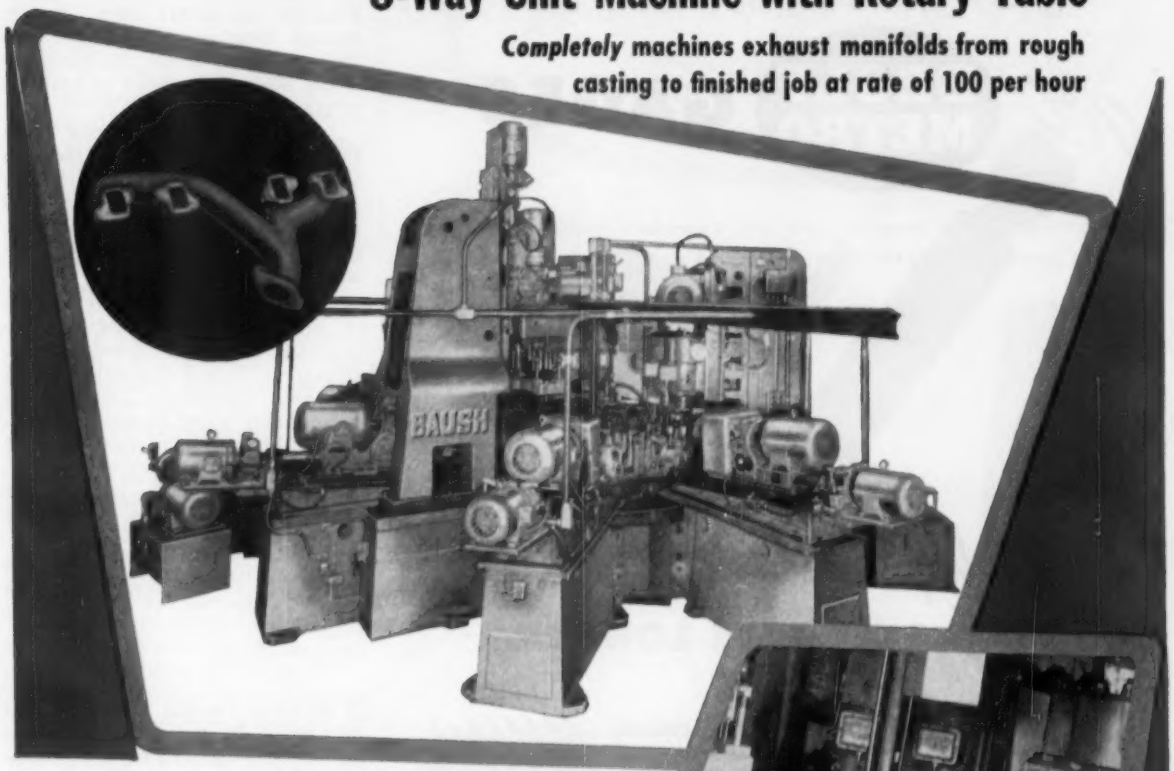
The enterprise employing Mills

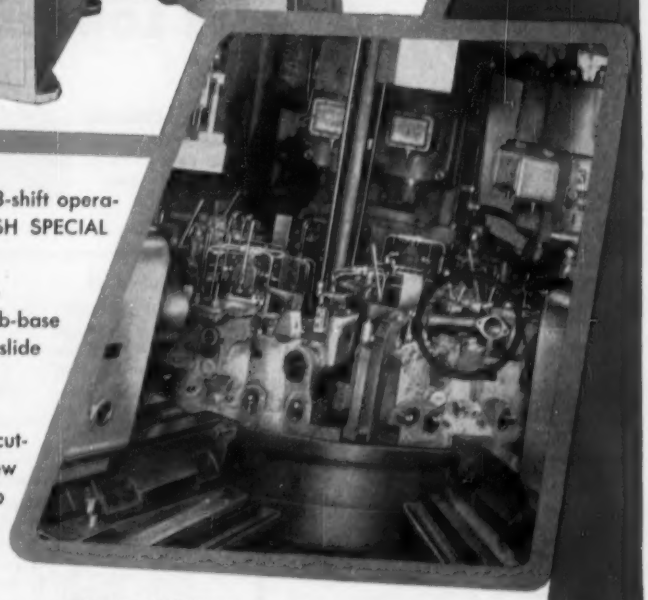
"I'm accident prone."

BAUSH

8-Way Unit Machine with Rotary Table

Completely **machines exhaust manifolds from rough casting to finished job at rate of 100 per hour**





Exceptionally rugged to stand up under continuous 3-shift operation with a minimum of down-time, this NEW BAUSH SPECIAL 8-WAY UNIT MACHINE consists of:

- 2 Vertical hydraulic units mounted on cross slide
- 1 Vertical angular hydraulic unit mounted on sub-base
- 1 Vertical hydraulic unit mounted on horizontal slide
- 3 Vertical angular mechanical leadscrew units
- 1 Vertical angular hydraulic unit

Units are equipped with 3 milling heads, 2 spherical cutting heads, 2 drilling heads and 1 individual leadscrew tapping head. Hydraulic "V" jaws clamp part into 8 holding fixtures mounted on an 80" diameter rotary table having paddles that automatically dispose of chips to outside of machine.

Total weight 110,000 lbs.

Closeup of fixtures showing manifold in position for machining.

Send us your problems and prints — let us design and build your next single purpose multi-spindle machine tool. We have the experience and "know-how," backed by over 60 years of making machines that will "stand-up" to any job.

BAUSH machine tool co.

SPRINGFIELD 7, MASS.

Works: Ambridge, Pa.—Chicago, Ill., Newark, N.J.—Putnam, Conn.

for { —greater confidence in gaging results
—continuous uniformity of production
—lower gage costs per piece inspected

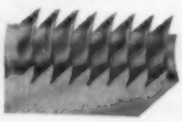
get BESLY METRO GAGES

Quality-Built to

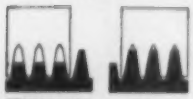
STAY ACCURATE LONGER

Micro-Lapped Finish
keeps gages accurate longer by reducing wear. No sharp "hills" and "valleys" to wear quickly and reduce gage accuracy.

Extra Clearance
at root of ring gages permits wear correction.



Truncated Thread Form



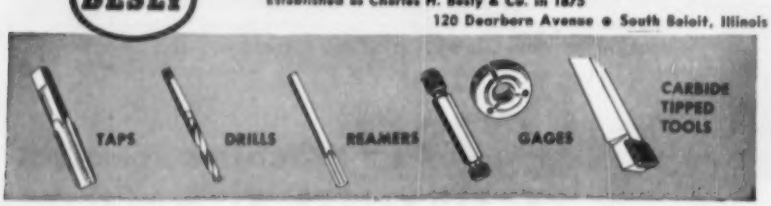
of thread plug at no extra cost. Enables accurate setting and permits easy check for gage wear.

Convolution of First Full Thread
on thread plug and ring gages removes sharp scoring edges and prevents chipping. Also makes Besly-Metro Gages easier to use.

Stress-Relieved
during manufacture by "deep-freezing" to normalize and relieve stresses and strains.

Lapped and Inspected at 68°F.
in air conditioned room which duplicates Bureau of Standards requirements.

BESLY **BESLY-WELLES** CORPORATION
Established as Charles H. Besly & Co. in 1875
120 Dearborn Avenue • South Beloit, Illinois



should adopt an emergency aid plan to help its employees in real financial difficulties. Set up a fund. Grant assistance to employees for emergencies resulting from illness or death in their immediate family or from disasters such as fire, floods, or hurricanes. Employees would not contribute to the fund; the company would bear the expense of administering the plan.

Allow employees to borrow up to $500. Charge no interest for loans up to $300. Charge 3% interest for loans over $300. Repayments for loans are to be made by deducting relatively small amounts from the employees' weekly paychecks.

The establishment of an emergency aid plan has its benefits to the employer. It builds morale among employees. It is a charitable act. It improves community relations. It will attract more prospective employees to the employment office. It is in the best interest of all concerned, and not for the best interest of a Mr Mills or any other loan shark.

Peter A Seward
Swampscott, Mass

IF MILLS is loaning money to Al's men and is doing it outside of working hours then, as Ed says, it is none of Al's business, but if Mills is starting to run a small loan business among the men during working hours then it definitely is Al's job to put a quick stop to it and fire Mills if he pays no attention to Al's warning.

A good sized shop can, and will,

"Now you listen to me for a change and stop turning your hearing aid down on me!"

rapidly deteriorate into a happy hunting ground for all kinds of selling, swapping, discount bargains, raffles, and pools if the foreman is not alert and does not know when to put a stop to the get-rich-quick schemes while overlooking the harmless and friendly ones.

No matter what Al does he will never be able to help some of the men who waste their money and are continually broke and in debt. However, there are a lot of good, sensible men who just do not know any better, or do not think clearly about what kind of trouble they are headed for when they over-purchase things; these are the men who generally can be helped and are appreciative of sincere advice. These are the chaps who, under good foreman leadership, will develop into substantial, reliable workmen who can be depended upon in an emergency and whose workmanship is not only first class but is dependable. They do not, so to speak, forget the lock washers when reassembling.

A good example of the "I've got some money—let's go and spend it," line of thought was a youngish chap —let's call him Joe—who was in charge of one of the maintenance crews. One Wednesday a long distance call came in from a lawyer in Chicago for Joe and he was called in from his crew and took the call. No further attention was given to him, but an hour later the maintenance engineer found Joe's crew loafing around. They said they had run out of work and no one knew where the boss was. A complete search of the plant failed to locate Joe. His street clothes were in his locker with his uneaten lunch but there were no signs of him anywhere around the plant. A phone call to his home was unanswered.

Later in the afternoon the personnel director drove to Joe's home and found a strange state of affairs. It seemed that Joe had come running home in his overalls and soon after this he and his wife had visited their neighbors and said they were leaving town at once and were offering all their furniture and property at ridiculously low prices for spot cash. The neighbors were delighted and in a couple of hours had bought everything. Then Joe and his wife got into their car and drove away. There was no forwarding address or any other information. The police said nothing, good or bad, about Joe or his wife had been received and the whole affair was a mystery. Joe's things at the shop were wrapped and stored. Later his pay check was filed

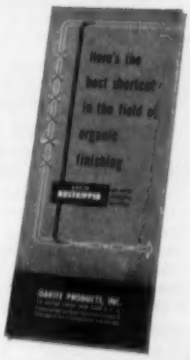
Do you need better ways to strip paint?

When tough finishes resist your present stripping methods, you may need help on some of these problems:

1 How to strip oil-base paints . . . synthetic enamels . . . alkali-resistant plastics . . . resin-base paints . . . japans . . . wrinkle finishes . . . nitrocellulose lacquers . . . alkyds . . . phenolics . . . ureas.

2 How to strip zinc chromate primers without etching aluminum.

3 How to strip paint from vertical surfaces and undersurfaces where thin-bodied strippers run off without doing their work.



4 How to strip metal parts that are too large to be soaked in tanks.

5 How to strip paint, pigment residues, phosphate coatings and rust in one operation.

6 How to strip paint from rejects, conveyor chains, racks and hooks in continuous operation.

Oakite has more than a dozen fine stripping materials for these and similar jobs.

FREE For information on problems 1, 2, 3 and 4 ask for a copy of "How to STRIP PAINT". For more on problems 5 and 6 ask for "Here's the best shortcut in the field of organic finishing". Write to Oakite Products, Inc., 24 Rector St., New York 6, N. Y.

OAKITE

Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

Now! Closer gage block tolerances give you up to 75% longer wear life at no increase in price!

Ellstrom Standards are now produced and unconditionally guaranteed to specified millionths well within the following improved gage block tolerances:

"W" Working Accuracy Blocks: +.000008", −.000002" per inch of length, with flatness and parallelism held within .000006".

"I" Inspection Accuracy Blocks: +.000004", −.000002" per inch of length, with flatness and parallelism held within .000004".

In addition to providing finer accuracy at no increase in price, these Ellstrom Standards also give you up to 75% longer wear life. For, by reducing the allowable "minus" deviation, you get an additional guaranteed wear allowance of from 2 to 6 millionths of an inch, as compared to common industry standards, before the blocks need be considered worn undersize.

Ellstrom Standards are furnished in 28 basic sets of from 8 to 92 blocks in both rectangular and square styles. Individual blocks are also available in sizes ranging from .010" to and including 20.000" to meet your particular needs. Send for complete specifications and prices today!

Set No. 35-R: "W"—$195.00; "I"—$280.50

Set No. 81-SA: "W"—$545.00; "I"—$784.35

ELLSTROM STANDARDS DIVISION
DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

• Ellstrom Internal Setting Gage—12" range: $185.00

• Ellstrom Rectangular Gage Block Accessory Set: $288.95

• Ellstrom Master Sine Bar "W" Accuracy: $112.50 "I" Accuracy: $152.75

for him, should he ever return, and in a couple of years he was practically forgotten.

Three years passed and then an expensively dressed Joe, driving a Cadillac, arrived at the plant and apologized for his stupid action three years before and asked if he could have his old job back. What had happened, he explained, was that the phone call had come from a lawyer and was a notification that an almost forgotten uncle in Chicago had died and he was the heir to the estate which, after all expenses had been paid, amounted to almost $45,000, and in those days they were real dollars. Joe promptly forgot his job and everything else in his haste to get hold of that money and he made a bee line for home, got rid of everything for ready cash, took his wife and drove, in his old car, to Chicago where he received the money. He then bought the Caddy and he and his wife drove on to Los Angeles where they lived in grand style for three years. The bank account by that time gave out and they barely managed to get back before they were broke.

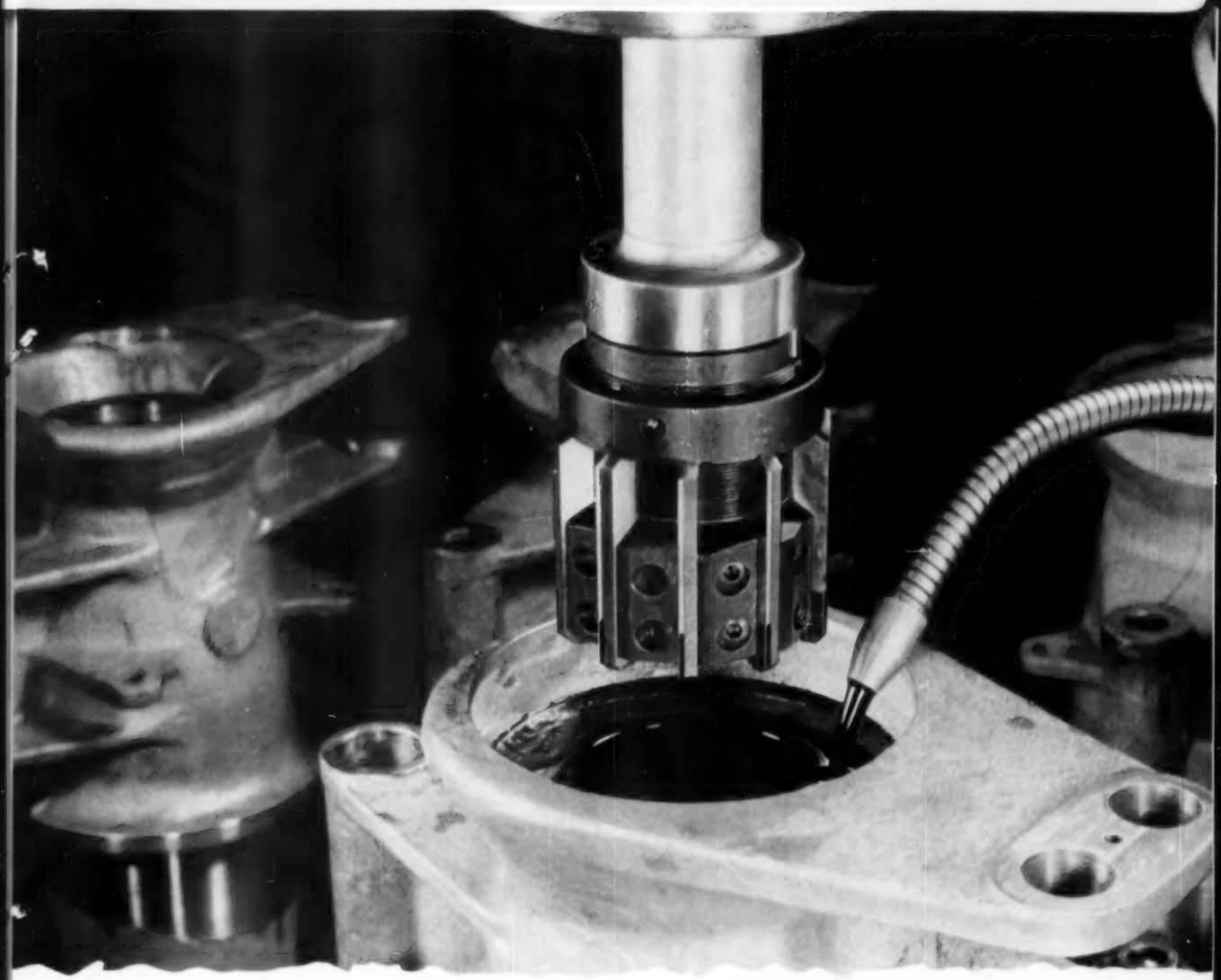
Outside of being a complete idiot in financial matters, Joe was a very good maintenance man and he was, after appropriate warnings, given his old job back. This job he filled to the full satisfaction of the company, but he still is almost continuously broke and is the type that could easily be talked into borrowing money at a high interest if there was a Mills working around the plant and loaning money on the side. Fortunately, there is no such employee there since the superintendent has a knack of finding out about these things just about as fast as they develop and he stops them before they gain momentum.

George P Pearce
Albuquerque, NM

QUICK STUDY . . . OR TRY-AND-SUCCEED?

Is a foreman the best judge in sizing up and placing a job applicant in his own department? Or is Personnel better equipped to gage the abilities and experience of the worker?

THE MAN in the office just hasn't got the true concept of the real shop environment. Until you have been there, worked there, and belonged there, you just do not know what it is like. The man who has read about and been told about the shop is in a position analogous to the tourist



TOOL LIFE INCREASED 400%

CLEVELAND Carbide Tipped Adjustable Reamer sets new high record!

The specifications on this job call for reaming a 4½" hole to a tolerance of .001" and a surface finish of less than 50 R.M.S. (micro-finish). CLEVELAND Carbide Tipped Adjustable Reamers are meeting these requirements day after day... month after month... *and reaming five times as many holes per grind as the conventional high speed reamers formerly used.*

Whenever *you* have a difficult reaming problem, a CLEVELAND Service Representative can help you. Contact our nearest Stockroom, or...

Request your copy of this descriptive booklet on CLEVELAND Carbide Tipped and Solid Carbide Cutting Tools

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

THE CLEVELAND TWIST DRILL CO.

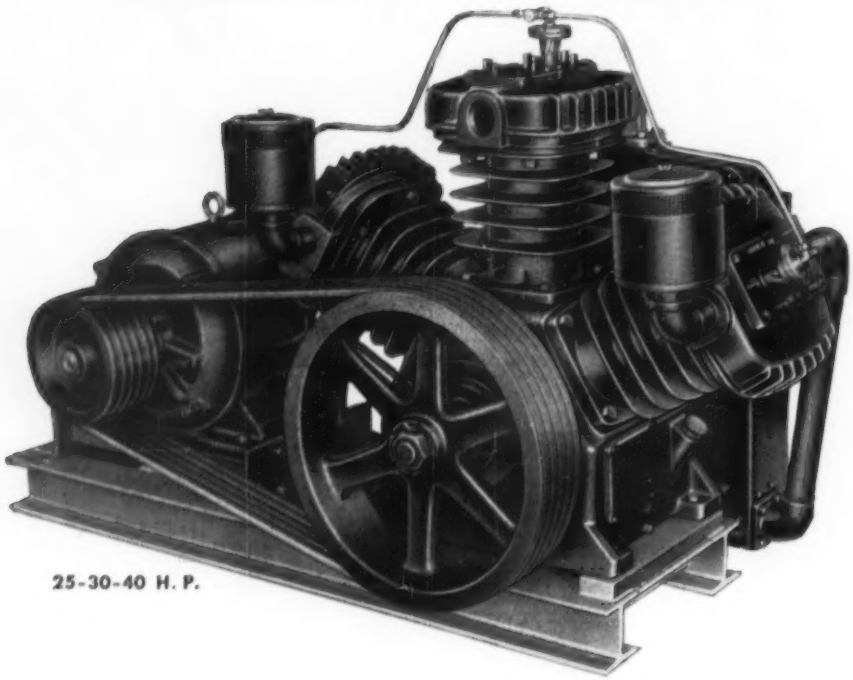
1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

THE NEW CURTIS MODEL C-100
TWO-STAGE, AIR-COOLED AIR COMPRESSOR

Provides Higher Operating Efficiency
Costs Less to Install



25-30-40 H. P.

THIS NEW Curtis Two-Stage will deliver more air per minute, per horsepower and per kilowatt hour of electrical energy consumed, thus assuring a saving in your electrical bill.

It's Air Cooled, thereby eliminating expensive water bills and assuring quick and easy installation with no complicated plumbing problems.

The new C-100 embodies all the well-known Curtis engineering features such as centro-ring oiling and Timken Main Bearings.

For complete information write for illustrated folder.

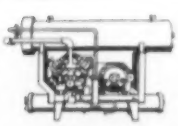
Remember, you can count on . . . OUR 102nd YEAR

Curtis

MANUFACTURING COMPANY • PNEUMATIC DIVISION

1924 KIENLEN AVE. • ST. LOUIS 20, MO. CM-6

AIR HOISTS
AIR CYLINDERS



PACKAGED LIQUID
CHILLERS

AUTOMOTIVE
AIR COMPRESSORS

AUTO LIFTS

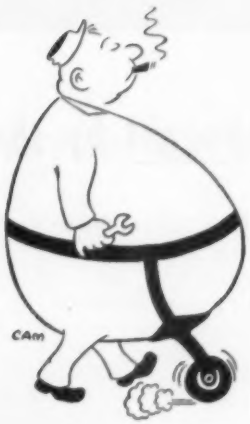
PACKAGED
AND
REMOTE
AIR
CONDITIONING

who thinks he knows the culture of a nation because he has read the travel folders and listened to the lectures of the travel guide. Without having worked in the shop the personnel man cannot take the true measure of an applicant, and until you can measure you do not know.

The office is a sphere where written and vocal communications are the primary functions. The office man lives and thinks in this environment. The shop man has a limited need for these tools and lives in a more material world, a world of doing. During my years in the shop I met many a man who had talked his way past the personnel department into a job that he didn't deserve, a job that was past his ability. On the other hand I have known many a good mechanic who experienced difficulty getting a job via this route. These men knew their jobs and were good workers but because of limited vocabulary or language difficulties failed to make a good impression on the personnel department. In plants where the foreman is consulted on these matters the situation is reversed. The applicant cannot talk his way past an experienced shop foreman no matter how well developed is his elocution and his diction.

Ability and know-how are not the only requirements necessary to insure an applicant's success in the shop. He should know how to get along with people, shop people. This ability to get along is more important in the shop than in the office. Here again all arrows point toward the foreman as the man best suited to determine whether the applicant possesses this qualification. He knows just what is required and he can readily determine if the man has it.

H Koslow
Bronx, NY



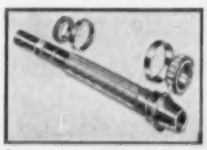
SHELDON
CHICAGO U.S.A.

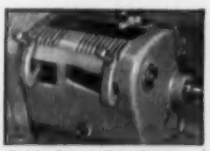
NEW Sebastian
13" A-5 GEARED HEAD PRECISION LATHE

This is a completely new Sebastian Lathe *designed and built by Sheldon* . . . a rugged work horse with extra power, toolroom accuracy and all the modern features that make for money-saving production . . . with all controls centrally grouped in easy reach for safe efficient operation.

Modern, heavy cast-iron pedestal (included in base price of lathe) completely encloses motor and drive . . . with storage space in tailstock leg for tools and chucks.

Speed changes easily made by revolving speed dial on headstock


Heavy, multiple Splined Spindle with "Zero Precision" tapered roller bearings


Quick change Gear box provides 60 different threads or feeds — has built-in lead screw reverse

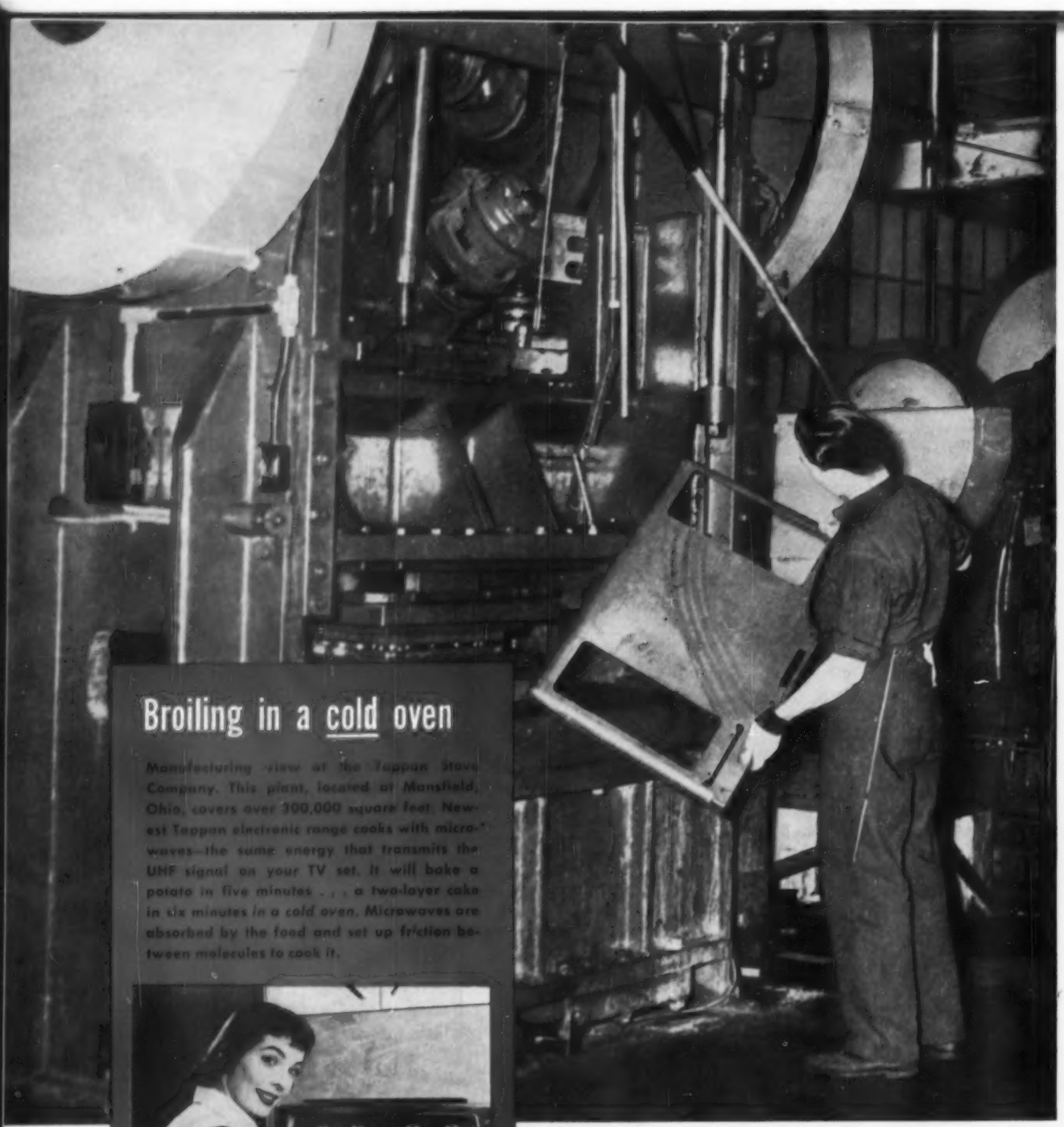
Massive 1-piece, double walled apron with gears running in oil has "1-shot" pressure lubrication system for carriage and ways

Cam action tailstock clamp permits rapid release and instant locking of tailstock

Run this new Sebastian lathe. Test its performance. You will appreciate the powerful cuts that this lathe can take.

Write for circulars on 13" and 15" Sebastian lathes and name of nearest dealer where you can see and operate these outstanding lathes.

SHELDON MACHINE CO., Inc.
Builder of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes
4234 NORTH KNOX AVENUE • CHICAGO 41, ILLINOIS



Broiling in a cold oven

Manufacturing view at the Toppan Stove Company. This plant, located at Mansfield, Ohio, covers over 300,000 square feet. Newest Toppan electronic range cooks with micro-waves—the same energy that transmits the UHF signal on your TV set. It will bake a potato in five minutes . . . a two-layer cake in six minutes *in a cold oven*. Microwaves are absorbed by the food and set up friction between molecules to cook it.

Bought by the men

American Machinist

HELPS YOU SELL...

Metalworking plants such as Tappan Stove Company where 90.65% of purchase dollars go for machinery, materials, parts and supplies needed for production

THIS PURCHASING PATTERN is evidence of the volume buying decisions made by Metalworking company production engineers and executives all over the country.

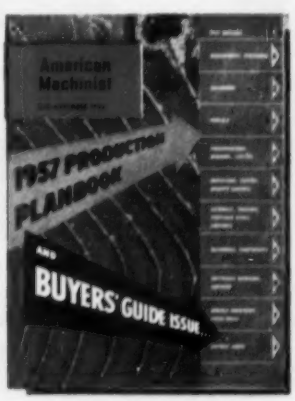
These same men continuously strive to execute intelligent purchases by judicious selection from dozens of competing sources. A problem in itself . . . a problem of capturing top value for each dollar spent.

To help you establish the most favorable climate for selling your brand – put your advertising in *American Machinist*. It is actively read by over 38,000 Metalworking production engineers and executives – many thousands more than subscribe to any other Metalworking magazine.

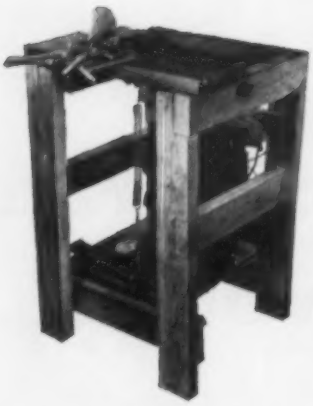
In this way you'll maintain your brand identification . . . build brand preference . . . sell the merits of your products *to the people who count*.

who buy for Metalworking . . .

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
McGRAW-HILL BUILDING, NEW YORK 36, N.Y.
PUBLISHED EVERY OTHER MONDAY
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS
AND THE ASSOCIATED BUSINESS PUBLICATIONS



From the



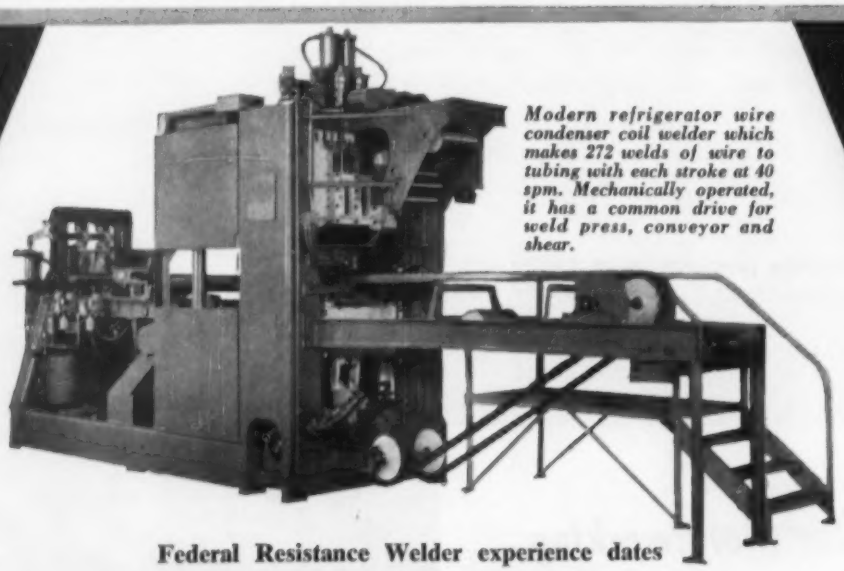
beginning . . .

First experimental multi-spot welder model developed in 1901 for welding fan blades to hubs.

FEDERAL

has always been

FIRST IN RESISTANCE WELDING



Modern refrigerator wire condenser coil welder which makes 272 welds of wire to tubing with each stroke at 40 spm. Mechanically operated, it has a common drive for weld press, conveyor and shear.

Federal Resistance Welder experience dates back to the very beginning of resistance welding. From that day to this, Federal has remained "First in Resistance Welding" engineering, design and development.

5

Federal WELDERS · Warco PRESSES

THE **FEDERAL** MACHINE AND WELDER COMPANY
WARREN, OHIO

Announcing VK MICROGAGES

.000008" ACCURACY

81-BLOCK SET
$250.00

30% *more wear surface than rectangular blocks*

Two really new and important facts should be noted in this announcement by Van Keuren: the closer tolerance of ± .000008" on VK Microgages, and the 81-block combination of ⅞" diameter longer-wear gages . . . now available for the first time.

These fine quality precision gage blocks by Van Keuren are products of the same machine-lapping and inspection techniques as Van Keuren Rectangular and Solid Square gage blocks. Size tolerance as already noted is guaranteed, as well as a maximum surface roughness of 1.4 RMS. Because their round shape provides greater wear surface, Van Keuren Microgages can be depended on for longer life and lower cost. Their closer tolerance has been particularly developed to meet today's demands for more exacting precision in shop work.

In addition to the new 81-block closer tolerance set featured here, Van Keuren offers 15 other standard sets of Microgages; also Solid Square type sets of gage blocks in .000004" accuracy and Rectangular type sets in .000004" and .000008" accuracy. For further information address: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

37th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

Maintenance Problems Licked

at new low cost

the most economical unit on the market!

low, low initial cost . . . only $359 f.o.b. factory

low, low operating cost . . . uses half as much fuel.

Outperforms big, costly machines where a handy steam cleaner is needed. Pressure impact of hot cleaning solution penetrates smallest cracks and crevices. Permanent mount or (optional at small additional cost) portable on rubber tire wheels.

cleans, sterilizes, disinfects, heats, sprays . . . practically anything!

Vapor Heating Corporation
80 East Jackson Boulevard, Chicago 4, Illinois, Dept. L-11
Send me bulletin No. 442 containing full details about the new Vapor "45" Steam Cleaner.

Name_____ Position_____
Company_____
Address_____
City_____ State_____

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

Model "D"

* A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

WRITE for COMPLETE DETAILS

CHANDLER TOOL CO
Muncie Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

... the Quality Line

STEEL
Stanho
PRODUCTS

Stainless Steel TAPER PINS

Complete stock, all sizes #7/0 through #14.
Special sizes to order.
Milled or Centerless Ground (Precision Type).
Made to accurate tolerances.

Also "Stanho" Taper Pins made from selected screw stock, Monel, Brass, Aluminum or other metals. Clean bright finish —prompt shipments.

Write for description and prices.

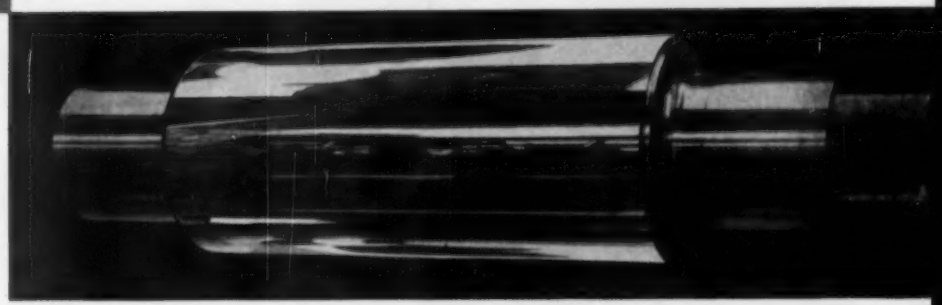
JM-6

STANDARD HORSE NAIL CORP
Since 1872
NEW BRIGHTON, PA.

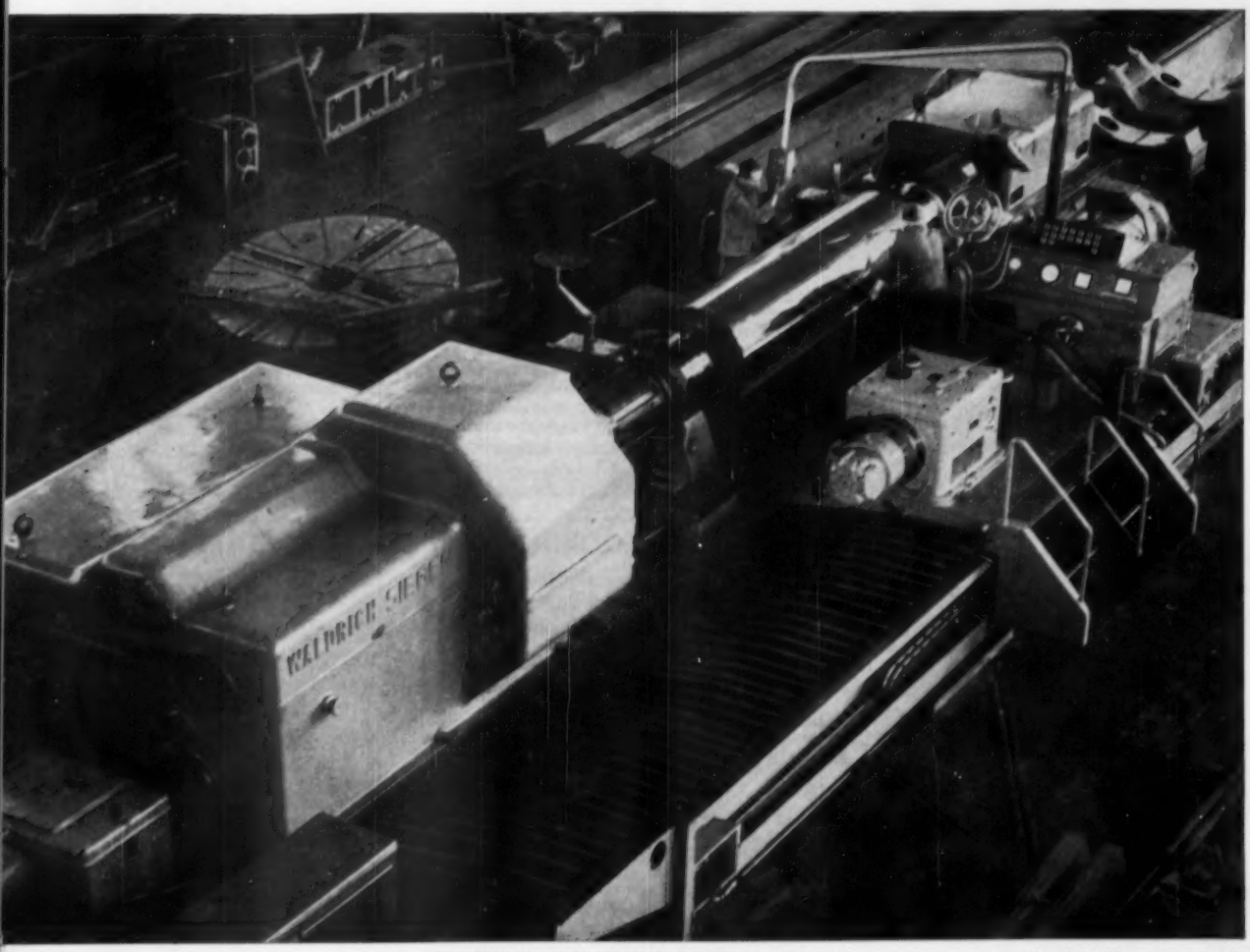
WALDRICH SIEGEN

H. A. WALDRICH GMBH SIEGEN GERMANY

HEAVY MACHINE TOOLS



Our long years' experience in the manufacture of more than 1,200 Roll Grinding Machines enabled us to build the largest Roll Grinder for rolls up to 130 tons of weight, realizing both an irreproachable polish and a most accurate geometric curve.



WALDRICH SIEGEN ROLL GRINDER WSI 1800, the largest Grinding Machine ever built.

send it out to CDT

There is no faster, more reliable way to get help with difficult tooling problems than to send it to Columbus Die-Tool. Backed by 50 years of experience, CDT has three basic objectives when designing and building tools, jigs, fixtures or special machinery.

1. Increase Production
2. Improve Quality of Product
3. Lower Production Costs

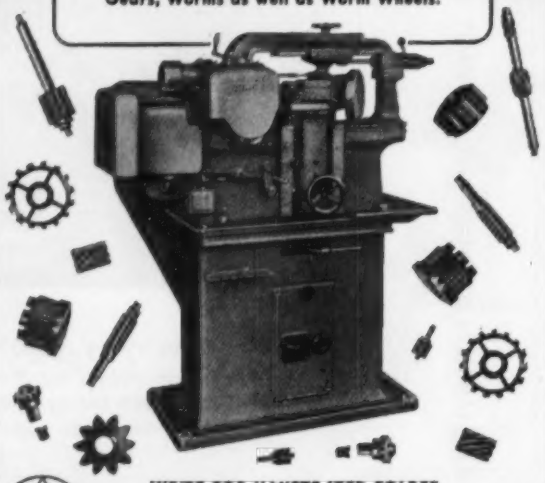
These and other benefits are reasons why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool. Perhaps we can solve your tooling problem and help you make your product . . . better, for less.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

KOEPFER GEAR HOBBING MACHINE

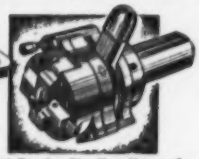
A Universal Purpose Machine for the economical production in either small or large quantities of Spur Gears and Pinions, Spiral Gears, Worms as well as Worm Wheels.



WRITE FOR ILLUSTRATED FOLDER

GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200AM LAFAYETTE ST. • NEW YORK 12, N. Y.

H&C Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Pacific Coast Rep: *A. C. Berbringer, Inc., 834 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

POPE SUPER-PRECISION BORING MACHINE
Bores Holes Round Within Millionths

Table actuation all electrically controlled
Feed and traverse rates infinitely variable
Write for Bulletin S-9

POPE MACHINERY CORP. • Est. 1920 • HAVERHILL, MASS.
BUILDERS OF POPE PRECISION SPINDLES

LOOKING FOR A SPECIFIC PRODUCT?

See the Index of Products Advertised in each issue. You'll find products advertised classified by type with page numbers of the advertisements.

AMERICAN MACHINIST
McGraw-Hill Building, New York 36, N. Y.

TANNEWITZ
VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 FPM. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.
The TANNEWITZ WORKS Grand Rapids, Michigan

MULTIPRESS® precision-assembles hardware parts

8-ton Denison hydraulic Multipress equipped with indexing dial, used to stake shanks and inserts for door knobs.

Assembling hardware components at The Yale and Towne Manufacturing Company is handled with marked efficiency with Denison hydraulic Multipress.

For example, an 8-ton Multipress, equipped with an indexing dial, closes brass scalp on brass cylinder shell.Components are loaded manually at the front of the index table well away from the press ram. The table indexes automatically to position the work beneath the ram.

After closing, with a single swift press stroke, the assemblies index to an unloading station where they are ejected automatically by air to a conveyor belt.

Yale and Towne also uses Multipress to assemble glass door knobs. Breakage has been virtually eliminated because of accurately controlled pressure of the Multipress ram.

Check into the Denison hydraulic Multipress to improve your production methods – cut your costs. A Denison engineer will gladly show you how. Write to Denison Engineering Division, American Brake Shoe Co., 1164 Dublin Road, Columbus 16, Ohio.

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

DENISON HydrOILics

WHEN SHARPENING DRILLS

PRECISION

IS ALL-IMPORTANT...

THE *Oliver*

DRILL POINTER

With the Oliver 510 Drill Pointer, all of the movements in sharpening a drill are automatic, and accomplished by fixed mechanisms to eliminate all chance of error. The Oliver 510 holds all drills from ¼" to 3" diameter and provides varying angles from 82 to 160 degrees. Available for either wet or dry grinding.

Oliver achieves the theoretically perfect point.

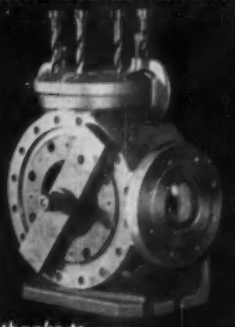
SEND A FEW DRILLS FOR FREE RESHARPENING . . . THEN BUY!

Oliver INSTRUMENT • COMPANY

1414 EAST MAUMEE — OLIVER OF ADRIAN — ADRIAN, MICHIGAN

FACE MILL GRINDERS • AUTOMATIC DRILL GRINDERS • DIE MAKING MACHINES
TOOL & CUTTER GRINDERS • DRILL POINT THINNERS • TEMPLATE TOOL GRINDERS

DRILLS 7% MORE GRAY IRON VALVE BODIES PER SHIFT



...thanks to

FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 11, Niagara Falls, N.Y. 84-01

CARBORUNDUM®

How to estimate the time element in any machining job

Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

Machine Shop Estimating

BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

486 pages, 480 illus., $7.00

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine-shop, large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job-time.

It covers every step—from setting up a job, to tearing it down—giving the specific time value established for each element. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating particular jobs on each type of machine in use today.

SEE THIS BOOK 10 DAYS FREE

McGRAW-HILL BOOK CO., INC.
330 W. 42nd St., NYC (36)

Send me Nordhoff's MACHINE SHOP ESTIMATING for 10 days' free examination on approval. In 10 days I will remit $7.00 plus few cents for delivery, or return the book postpaid. (We pay for delivery if you remit with this coupon—same return privilege.)

(Print)
Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position FA-12-3-56

This offer applies to U.S. only.

BUZZER
Reg. U. S. Pat. Off.

INDUSTRIAL *GAS* EQUIPMENT

BUZZER Equipment, a buy-word since 1911, provides the hottest and quickest heating . . . without blower or power. Wide range of turn down and heat control. You can depend on a BUZZER.

NO BLOWER OR OTHER POWER NEEDED

JUST CONNECT TO GAS SUPPLY

Send for complete BUZZER Catalog

Mfrs. since 1911

CHARLES A. HONES, Inc.
126 SO. GRAND AVE., BALDWIN, L. I., N. Y.
BURNERS - FURNACES (Heat Treating, Melting, Soldering)

MAGNESIUM for low cost tooling

DOW

MAGNESIUM *machinability beats tight schedules*

Machinability and handling ease are two reasons Carr Lane moves jobs faster, at lower cost, with magnesium tooling plate

When a job has to be completed in a hurry, which is often the case at Carr Lane Manufacturing Company, St. Louis, there are big advantages in using magnesium tooling plate.

FASTER MACHINING. Production operations go faster because magnesium jigs and fixtures are easy to machine, easy to weld. Excellent dimensional stability and precision flatness help to hold the closest tolerances. These properties also help to save many hours in the process. On the fixture illustrated, it would take twice as long to do the job in aluminum—and ten times as long in steel.

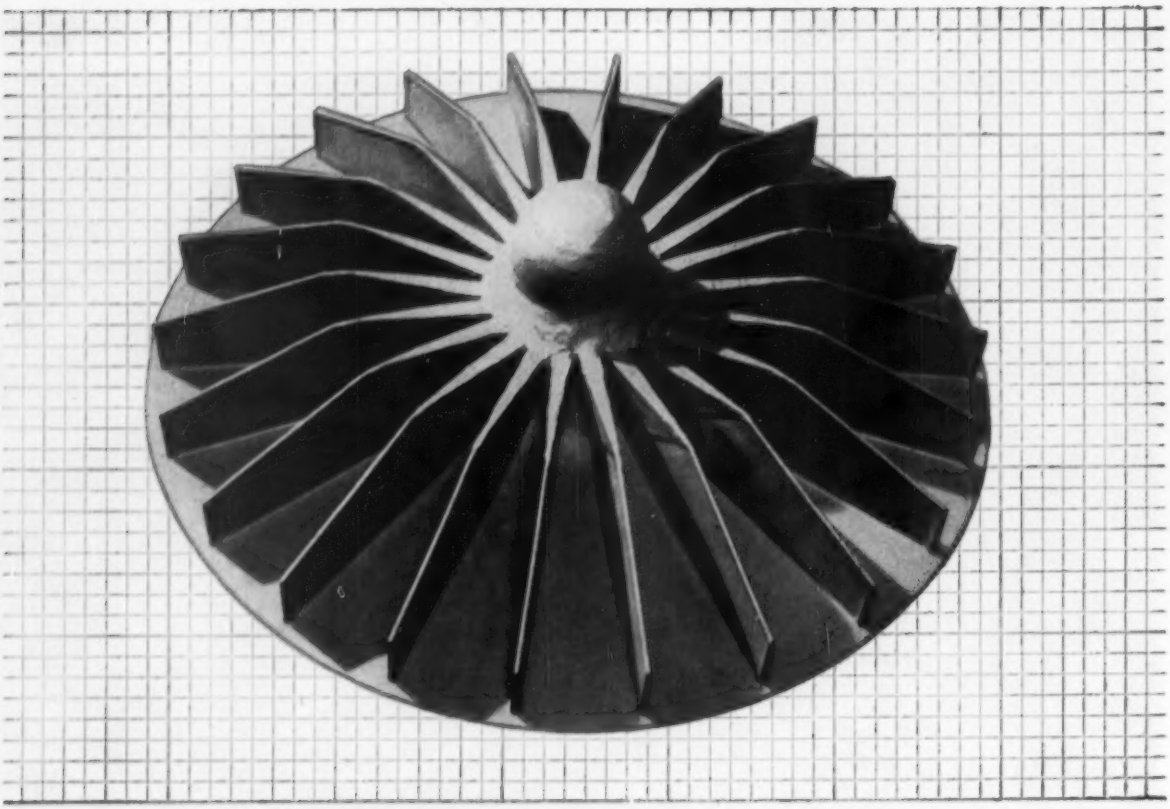
FASTER HANDLING. The light weight of magnesium, two-thirds that of aluminum, permits pieces to be handled and moved from one operation to another with a minimum of time, effort and equipment. This is particularly important with large jigs and fixtures which couldn't be handled manually if they were made of steel.

FASTER AVAILABILITY. You can get magnesium tooling plate when you want it and how you want it. Whether production deadlines are tight or not, it's always readily obtainable in any standard size and gauge from stock. Contact your nearest supplier of Dow Magnesium or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 372BB-1.

Available from stock at . . .

Copper and Brass Sales, Inc., Detroit, Mich. • Fullerton Steel and Wire Co., Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Co., Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

you can depend on DOW MAGNESIUM DOW



22-inch Diameter Wheels Investment Cast . . . at a 50% Saving

Turbine wheels, 22 inches in diameter and weighing close to 100 pounds, are now being mass-produced by HAYNES' precision-investment-casting process. The wheels are made of stainless steel and are used in the turbocharger section of a compressor. At one time a lengthy profile machining operation was needed to shape the intricate blades. Investment-casting eliminated this operation and cut production costs in half.

The savings realized on this wheel are typical of the many economies made possible by HAYNES' precision-investment-casting process. This modern mass-production method eliminates many machining, grinding, and assembling operations. Intricate contours, odd-shaped cavities, and thin edges can all be cast to size. Two or more parts can be designed and produced as one integral part. In most instances, an investment-cast part can be placed in operation as soon as it is delivered.

For information on how you can use HAYNES' investment-casting process to keep production costs down, write to any of the District Sales Offices listed below.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

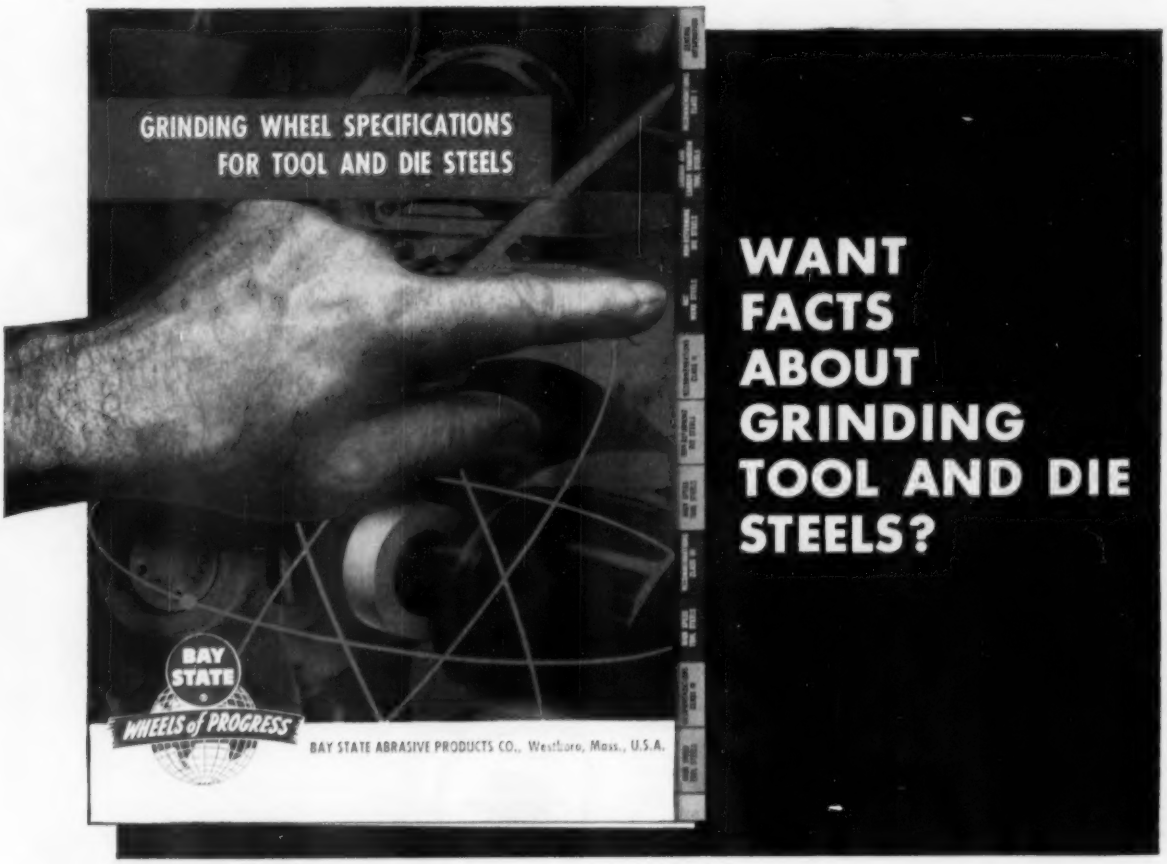
UCC

General Offices and Works: Kokomo, Indiana

Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes" is a registered trade-mark of Union Carbide and Carbon Corporation.


GRINDING WHEEL SPECIFICATIONS
FOR TOOL AND DIE STEELS
BAY STATE
WHEELS of PROGRESS
BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.
WANT FACTS ABOUT GRINDING TOOL AND DIE STEELS?

BAY STATE gives you these facts arranged for ready reference, in this new visible-index form. You can quickly locate the types of steel you use, and the recommended specification for grinding each.

This is a *functional* reference book, specifically designed for your benefit as part of the BAY STATE "Wheels of Progress" program. In your Tool & Cutter, Die Sinking, and Production Grinding operations, it will be a constant help.

Send for your free copy today.

BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO.,
Westboro, Mass., U.S.A.

Branch Offices and Warehouses —
Bristol, Conn., Chicago, Ill., Cleveland, Ohio, Detroit, Mich., Pittsburgh, Pa.
Distributors — All principal cities
In Canada:
Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

TO: BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASS.

PLEASE SEND ME A FREE COPY OF "GRINDING WHEEL SPECIFICATIONS FOR TOOL AND DIE STEELS"

NAME_____

COMPANY_____

ADDRESS_____

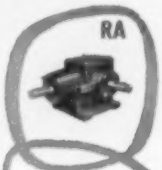
CITY_____ STATE_____

Grant Speed Reducers

YOUR ASSURANCE OF BETTER PERFORMANCE

The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.



Grant manufactures a complete range of types and sizes — worm, double worm, compound worm and spur, helical and mitre gear — with reductions up to 3660-1 — most available from stock. Write for the latest catalog, describing each type in detail.

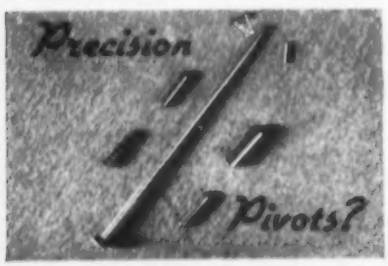
STOCK GEARS SPECIAL GEARS

SPEED REDUCERS

GRANT GEAR WORKS INC.

Founded in 1877 by George B. Grant, the Pioneer Gear Man

163 WEST SECOND STREET BOSTON 27, MASS.



The "spike" in the center is a common pin. The others are VK precision pivots.

Call VK

Steel, chromium plated, or carbide precision pivots to .013" diameter. 1 RMS or finer surface finish. Diameter tolerance to .000010". Chamfers, radii, lapped ends, etc.

Also volume production lapping of flat or round production parts.

Send us your specifications.

The VAN KEUREN COMPANY

176-C WALTHAM ST. WATERTOWN, MASS.

WHETHER YOU BUY...

OR SPECIFY...

This Unit Is The Answer To

- *production waste*
- *design problems*
- *fire risk*
- *excessive repair bills*

BIJUR

AUTOMATIC LUBRICATION

Automatic lubrication is one thing that designers, plant engineers and production men insist on these days —for their own machinery . . . and the equipment they manufacture. And careful purchasers make sure the automatic lubrication systems they buy are *Bijur Systems.*

For nothing protects like Bijur. Bijur Systems save production time and repair bills . . . reduce down-time and fire risk . . . lengthen machine life . . . and eliminate product spoilage due to over-lubrication. Bearings are never thirsty for oil, never flooded.

That's why it's just good business to have a custom-engineered Bijur System on the equipment you own, and *design* one into the equipment you manufacture. Installation is easy, cost is minimal, savings are substantial. Write today for *all* the facts about Bijur Systems! P-3

BIJUR

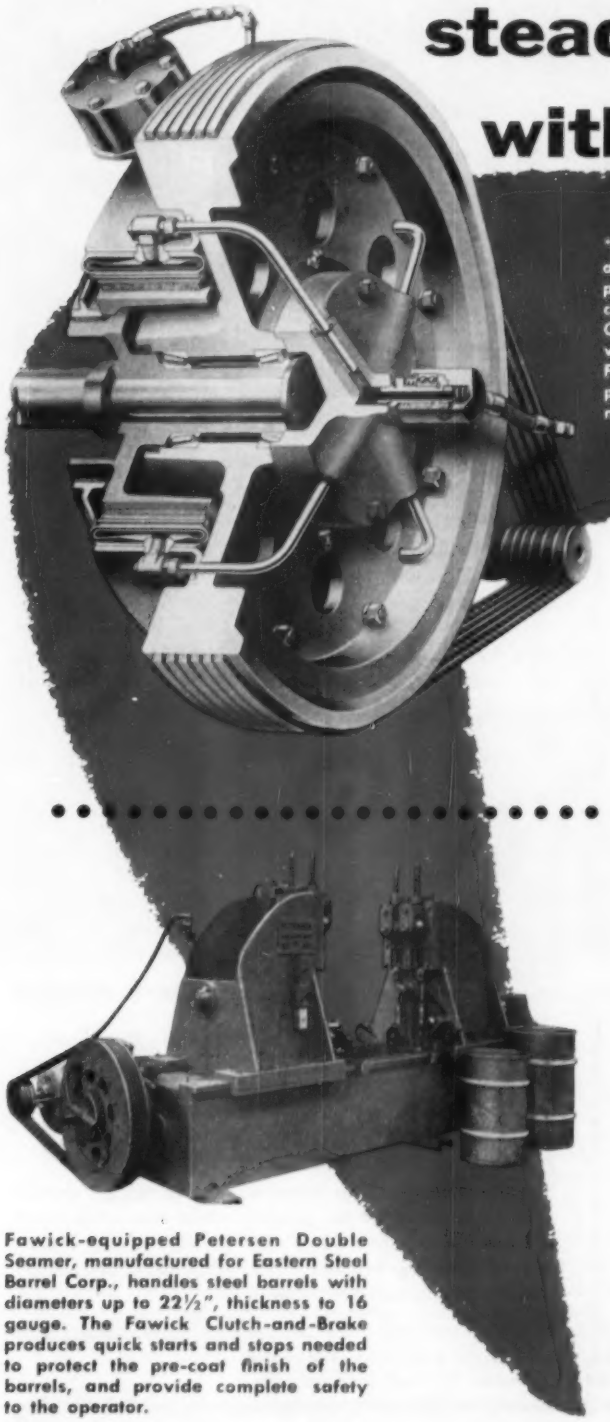
LUBRICATING CORPORATION

Rochelle Park, New Jersey

Pioneers in Automatic Lubrication

FSPA* takes tough, steady punishment with no downtime

*Fawick Standardized Press Applications are complete packages for conversion of production machinery to modern pneumatic control. They consist of a Fawick CB Airflex Clutch, C5 Brake, Rotorseal and new flywheel mounted on anti-friction bearings. FSPA increases machine production, improves safety, lengthens life and cuts maintenance.



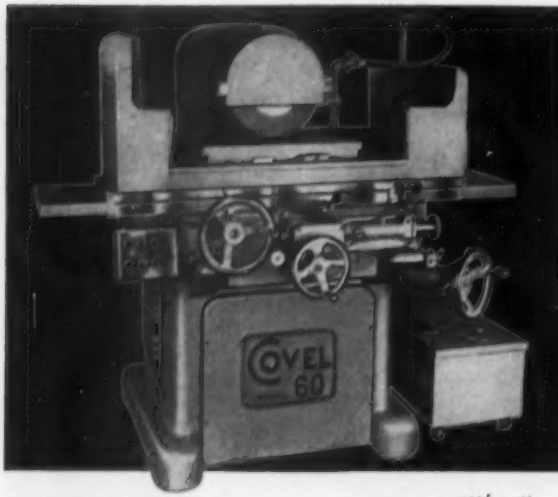
Fawick-equipped Petersen Double Seamer, manufactured for Eastern Steel Barrel Corp., handles steel barrels with diameters up to 22½", thickness to 16 gauge. The Fawick Clutch-and-Brake produces quick starts and stops needed to protect the pre-coat finish of the barrels, and provide complete safety to the operator.

A FAWICK Standardized Press Application has been selected by Petersen Tool & Die Works, Inc., for use on its new Double Seamer which is capable of producing a new barrel every five seconds! Reason: they needed a clutch and brake that could continuously produce split-second starts and stops, and fast steady cycling—without failing. Ordinary mechanical clutches in this service were breaking down as often as five or six times a year. FAWICK Clutches now do this same job without interruption—proof of their ability to stand up under rugged conditions.

Find out how FSPA can improve the operation of your production machinery. For more information, contact your nearest FAWICK Representative, or write the Home Office. Ask for Bulletin ML-172.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
In Canada: Fawick Canada Ltd., Toronto

FAWICK Airflex
INDUSTRIAL CLUTCHES AND BRAKES



Compare THESE FEATURES...

COVEL HYDRAULIC SURFACE GRINDERS

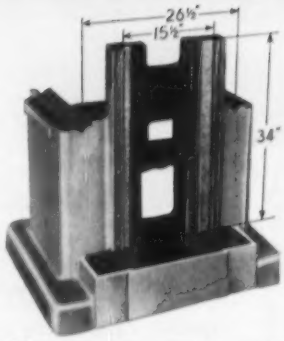
Available in three sizes

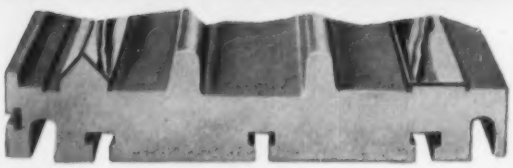
	No. 20	No. 35	No. 60
Work capacity	6"x18"x12"	8"x24"x11"	14"x24"x15"
Grinding wheel	10"x¾"x3"	12"x¾"x3"	14"x1"x3"
Spindle motor, HP	1½	2	3

ONE-PIECE BASE

Vertical and cross ways are integral for permanent alignment.

Length of vertical ways.....34"
Width of vertical ways.....15½"
Distance between double V cross ways.....26½"
Weight of base, 1570 lbs.





HARD CHROME TABLE WAYS

Special Covel plating process applies hard chrome surface direct to the close grain, alloy cast iron surface of V and flat table ways *after* they are precision hand scraped from a master plate. Tables in service for over five years show but slight wear, no flaking. Available at extra cost.

HARDENED AND GROUND LEAD SCREWS

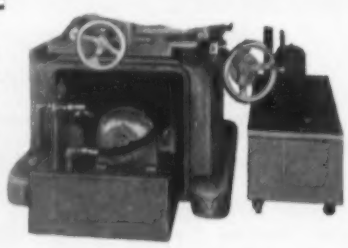
Made of best quality tool steel, Covel cross feed and elevating screws are hardened and ground to insure long-lived precision operation.

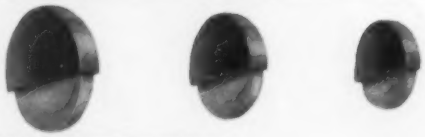
ELEVATING HAND WHEEL

Located *below* the level of the table where the operator can read the graduations easily and keep an eye on the work.

CLOSED HYDRAULIC SYSTEM

Prevents dirt or coolant from contaminating the hydraulic oil. Covel low pressure system throughout. 15 gallon oil reservoir located in base of machine slides out for easy maintenance.





THREE SPINDLE SPEEDS

This Covel cost reducer makes it easy to obtain proper peripheral speed for the grinding wheel even after wheel has been worn down. Permits use of worn wheels without loss of grinding efficiency. Cartridge-type sealed-for-life anti-friction spindle, V-belt driven.

These features, plus many others, are reasons why Covel is rated "tops" in surface grinders. Write or 'phone for full information.

COVEL PRECISION GRINDERS

HYDRAULIC & HAND FEED SURFACE GRINDERS
UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS

DEPT. AM-256
BENTON HARBOR, MICHIGAN
WAlnut 6-6157

Pictured above is Johnson's J-Cool—a superior coolant for all-purpose use—one of the complete line of modern coolants.

For 50 years nothing important happens to coolants . . . now a major improvement!

Johnson's discovery—the use of waxes and wax-type synthetics in specially formulated metalworking fluids—*is the first major improvement in coolants since 1900.*

Use Johnson's for high-speed machining, grinding and forming. Results will convince you of their superior performance. You'll get increased production from your men and machines . . . the quality of work will show a definite improvement. In other words, Johnson's can help you reduce costs and increase profits on your production lines.

Your Johnson's industrial distributor will be glad to set up an in-your-shop test of J-Cool . . . or any of the complete line of Johnson's Metalworking Fluids. Ask about Johnson's money-back *Guarantee of Superior Performance* over ordinary coolants.

S. C. Johnson & Son, Inc., Industrial Products Dept., Racine, Wisconsin

The new concept of vertical measurement is here

Webber Micro-Accurate OPTICAL HEIGHT GAGE

Webber Micro-Accurate Gages

This revolutionary new instrument will make micro measurements in the 1" to 61" range with an hitherto unknown overall accuracy of ± .000005" per inch of length.

These fantastic measurements are made speedily and easily by the average skilled workman.

Next to your Gage Blocks the new Webber Optical Height Gage will be the most useful tool in your shop. There is nothing like it in all the world.

Webber GAGE CO. 12901 Triskett Rd., Cleveland 11, Ohio

MORE PROFITS PER HOLE

with CLEEREMAN "Series A" *Automatic*

More Holes per Labor $ $ $

An automatic cycle that sets the production pace. Push button control leaves the operator free to handle piece parts easier and faster.

More Holes per Tooling $ $ $

The power to produce, coupled with extreme rigidity, drives cutting tools at utmost efficiency.

More Holes per Capital $ $ $

Fast set-up features, extreme versatility and operating speed broaden application and minimize idle time.

This machine,

equipped with two-station air operated indexing fixture and four spindle heads, has more than doubled previous production. Present installations are giving 125 to 600 cycles per hour with ease. The only limit is the machinability of your product.

WHAT is your problem?

Contact your nearby Cleereman distributor— or phone, wire or write direct.

BRYANT
Machinery & Engineering • Company •
General Office
555 West Washington Blvd., Chicago 6
Representatives in Principal Cities

CLEEREMAN MACHINE TOOL CORP., Green Bay, Wis.

SWISS **REISHAUER** MADE

UNIVERSAL THREAD and WORM GRINDERS

For Production or Tool Room Grinding Operations

The Type NRK UNIVERSAL Thread and Worm Grinder is designed for grinding with single or multi-thread wheels. This machine, with attachments, can be used for grinding and relief-grinding of external—right- and left-hand—single or multiple screw threads—to any desired profile.

THE NRK GRINDS:

- **Thread Gauges**
- **Taps — all kinds — straight or spiral flutes**
- **Thread Milling Cutters**
- **Trapezoidal Thread Spindles**
- **Thread Chaser Dies for self-opening die heads**
- **Gear and Worm Hobs**
- **Cylindrical Press Rollers**
- **Thread Rolling Dies up to 8" diameter**
- **Crushers for forming multi-rip grinding wheels**
- **Commercial Threads — plunge cut method — on all kinds of screws, studs, spindles, etc.**
- **Internal Threads up to 5" diameter**
- **Racks up to 18" long**

CAPACITY AND SPEEDS

Admits work pieces between centers	28"
Maximum length of thread ground	17-½"
Minimum thread diameter	.120"
Maximum thread diameter	8"
Minimum pitch	60 t.p.i.
Maximum pitch	3"
Width of single thread grinding wheel	.32"
Widths of multi-thread grinding wheel	.8" - 1.2" - 1.6"
Speeds of grinding wheel	1550 or 1900 r.p.m.
Speeds of work spindle	1.6 to 80 r.p.m.

SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE.

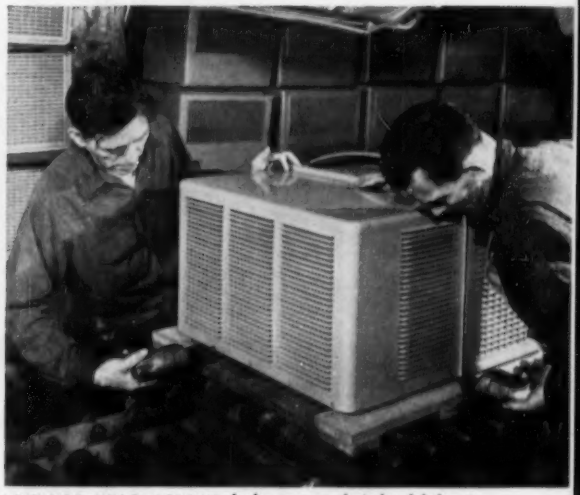
COSA — *nationwide sales and service of precision machine tools — from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

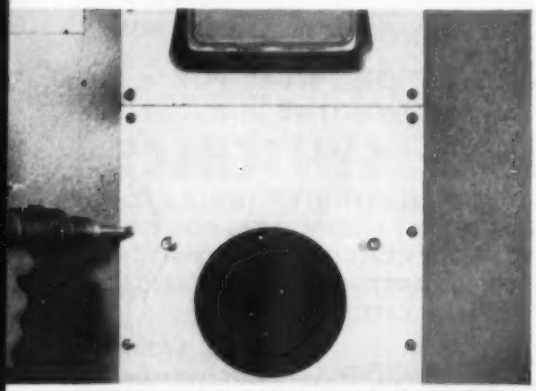
IN CANADA—COSA CORPORATION OF CANADA LTD., 11 60 Lakeshore Road, Long Branch, Toronto 14, Ontario

Neater, Better, Faster Assemblies with PHILLIPS CROSS RECESSED HEAD SCREWS

"PHILLIPS HEAD SCREWS are used in part to attach the instrument panel, inspection panels, compartment panels, wing tips, electrical panel and landing gear fastenings," says Mr. Counsil, a purchasing agent for the Piper Aircraft Corporation of Lock Haven, Pa. "In fact, it would be difficult to find any place in the plane where Phillips Head screws are not being applied."



"PHILLIPS HEAD SCREWS help us maintain highest quality and quantity," states Mr. W. E. Zielonka, plant manager of the Fedders-Quigan Corporation, Buffalo, N. Y., makers of famous Fedders room air conditioners and other products. Mr. Zielonka continues: "Our assembly line employees are the best salesmen for Phillips screws. They're paid by piece work, and fast, non-slip driving of screws means a lot."



"IDEAL FOR OUR OPERATION," is the verdict on Phillips screws at the Indianapolis plant of the Bryant Division of Carrier Corporation, world's largest producers of automatic heating units. "Phillips screws are terrific time savers, cause less waste and damage and give much tighter fit," reports Mr. Al Barnett, foreman of the Bryant general assembly department.

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

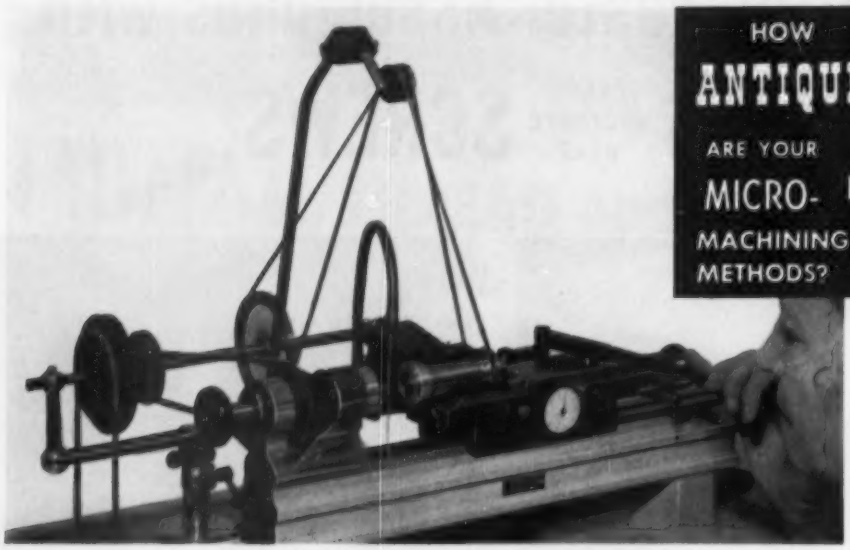
THE FASTENERS OF TODAY...
AND OF THE FUTURE
X marks the spot
the mark of extra quality

Pledged to highest standards...

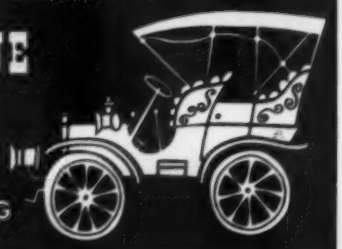
The Phillips Screw manufacturers listed here cooperate to turn out a uniformly high standard of quality. As sponsors of the Phillips Cross-Recessed-Head Standards Committee they adhere to the established dimensional standards, gauges, and gauging methods which will best serve industry.

Members of Screw Research Association

American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Co. Elco Tool and Screw Corporation • Great Lakes Screw Corp. • The H. M. Harper Company • The Lamson & Sessions Company • National Lock Company • The National Screw & Manufacturing Company • Parker-Kalon Division, General American Transportation Corporation Pheoll Manufacturing Co. • Scovill Manufacturing Company • Shakeproof Division Illinois Tool Works • The Southington Hdwe. Mfg. Company • Sterling Bolt Company • Universal Screw Company • Wales-Beech Corporation



HOW ANTIQUE ARE YOUR MICRO-MACHINING METHODS?



DRILL MICRO-HOLES

DOWN TO .0016" with SPEED & ACCURACY

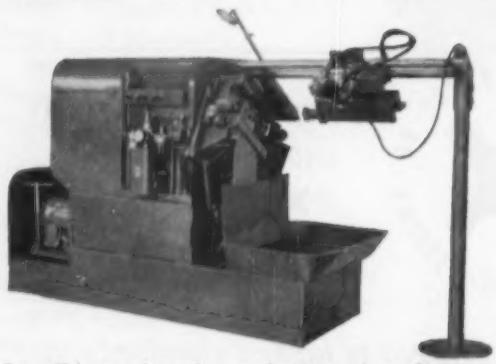
ON LEVIN® INSTRUMENT LATHES

The Levin micro-drilling equipment shown here can be used with the smallest drills available. It is designed so that the drilling does not depend on the operator's sense of feel. The drill can be retracted for chip removal and returned to the drilling position without striking the bottom of the hole. While commercial drills can be had as small as .0016" this micro-drilling apparatus has successfully produced holes as small as .0006".

Send for Catalog M describing complete line of instrument lathes and accessories.

LOUIS LEVIN & SON, INC.—3610 S. BROADWAY—LOS ANGELES 7, CALIFORNIA

MODERN CUTTING - OFF MACHINE



Cuts off longer pieces than regular automatic machines—*any length you want.* FAST cutting and chamfering of tubing, pipe, shafting. Check the following figures:

½" Tubing
Cuts and Chamfers both outside edges of ½" .058 wall tubing. 5" lengths, every 2.5 seconds.

¼" Cold Rolled
Cuts and Chamfers both ends, 20" long, at rate of 1 every 20 seconds.

1" Tubing
Cuts and Chamfers both outside edges, pieces 3" long. One every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 6¼" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

WRITE FOR ILLUSTRATED CATALOG

MODERN MACHINE TOOL CO.
2005 LOSEY ST. JACKSON, MICHIGAN

ANNOUNCING

AUTOMATION'S CURE FOR DOWN-TIME

DOYLITE SWITCHECK

ELECTRICAL CONTINUITY INDICATOR SHOWS INSTANTLY MECHANICAL POSITION AND ELECTRICAL CONDITION OF A SWITCH! PIN-POINTS FAILURE OF AN ELECTRICAL CIRCUIT!

Patent applied for

HOW IT WORKS

Doylite Switcheck may be used on switches carrying up to 130 volts maximum. Its neon lamp lights when switch is open, goes out when switch is closed. Its case is app. 3" W x 1½" x 2" H with 4 color-coded wires 12" long, 2 for connecting to 115 volt 60 cycle line, and 2 across the switch. Potting with an epoxy casting resin protects components from oil, moisture, and vibration. Easily mounted!

PRICE $10.95
(Quantity discounts to 10%)

A few openings for Manufacturers' Agents

Produced by
DOYLE DESIGN & MACHINE CO.
51-57 Scio St. (Hamilton 6-9390) Rochester 4, N.Y.

R.I.G. Case History No. 18

.004" PRECISION SLOT CUT IN 10 MINUTES WITH RAYTHEON IMPACT GRINDER!

USING CONVENTIONAL METHODS — OUTPUT ONE UNIT PER DAY

A precise, square cornered slot .004" wide, 5/8" long through a wall thickness of .050" is a requirement of this stainless steel hydraulic metering device. The only previously available method of cutting this slot was to break through the wall with a .004" milling cutter and then clean up the edges with a jeweler's saw. The milling cutter had to be run perfectly true and was likely to break even when operated by a highly skilled craftsman. The cleaning-up operation with a .004" jeweler's saw was even more exacting. Keeping the saw in a straight line to produce the square corners and preventing breakage of the saw were extremely difficult. Under these circumstances it was impossible to predict a realistic production rate or cost of these parts. The production of one good valve per day was considered fortunate.

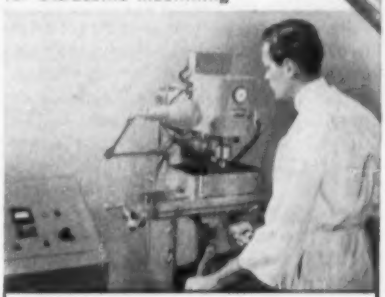
HOW THE IMPACT GRINDER CUTS THIS SLOT IN 10 MINUTES

A piece of cheap, commercially-available shim stock .0035" thick, 5/8" wide and 1/4" long is used as the cutting tool. A block of cold-rolled steel 5/8" square and 1/8" thick is slotted with a .0035" slitting saw and is silver-soldered to the Impact Grinder tool cone. Then the shim stock is soft-soldered into the slot in the block. The work piece is held perfectly horizontal in a locating fixture which also positions the shim stock. Using a #800 grit abrasive, the tool cuts through the wall in 10 minutes. Accuracy is .0002" and because the finish is 8 microinches, no further operations are required. To change the tool, the soft solder is melted and the shim stock replaced. The set-up is simple, no highly skilled craftsmen are needed and the saving of time and money is enormous.

SOLVE YOUR PROBLEM WITH THE R.I.G.

Perhaps you have an unusually difficult machining problem that can be solved with the Raytheon Impact Grinder. Write Dept. 6120, and our Application Engineering Service will be happy to assist you. For new catalog, please request bulletin No. 2-332, Dept. 6120.

Raytheon Impact Grinder for Ultrasonic Machining



FEATURES:

- Machines hard and soft steels, titanium carbide, tungsten carbide, ceramics—many other materials
- Simplifies tooling—speeds production of difficult jobs
- Cuts to .0002" — finishes to 8 microinches
- No heating of material or distortion of grain structure

RAYTHEON MANUFACTURING COMPANY

Commercial Equipment Division • Waltham 54, Mass.

RAYTHEON

A-2014

Excellence in Electronics

YOUR GENERAL PURPOSE
MARKING MACHINE

Marks tool steel, stainless, castings, other metals AND PLASTIC PARTS OR MATERIALS

- Air or motor drives.
- Marks flats, rounds and specials.
- With or without ACROLEAF HOT STAMPING HEAD.
- Quiet, fast operation.
- Perfect for Automation line.

Write for full data upon ACROMARK 9AH MARKING MACHINES for METAL and PLASTIC product marking.

The ACROMARK Company

"The Original Marking Specialists"

7-13 Morrell St., Elizabeth 4, N. J.

Production line D-C welder?

Is there any other?

Is there any other welder that compares with the *exclusive* advantages offered by the Westinghouse RA d-c welder? Such outstanding advantages as . . .

An exclusive 100% duty-cycle arc drive to prevent sticking and pop-outs at all settings that gives a hot start for easy starting.

Longer welder life—used indoors or out—because the windings are double-dipped and baked in silicon-fortified Bondite . . . because the exclusive baked-on enamel finish on Bonderized steel assures weatherproofing.

"Wide-amp control" far exceeds NEMA Standards in both the high and low ranges—another exclusive. Arc stability and balanced load with Westinghouse three-phase selenium rectifiers—originated by Westinghouse.

"Is there any other?" Compare—and prove to yourself the superiority of the Westinghouse RA. J-21951

Only Westinghouse offers this welding leadership!

WESTINGHOUSE ELECTRIC CORPORATION
Welding Dept., P. O. Box 868
Pittsburgh 30, Pennsylvania

☐ Please send full information on Westinghouse RA d-c welder.

☐ Have welding specialist call.

Name _____

Company _____

Street & No. _____

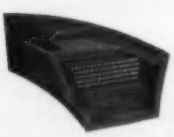
City _____ State _____

WATCH WESTINGHOUSE!
WHERE BIG THINGS ARE HAPPENING TODAY!

DODGE PRODUCTS
You Should Know-

AIR-GRIP CLUTCHES

TAPER-LOCK
CHAIN COUPLINGS



SEALED-LIFE V-BELTS

Dodge Bulletins you should have-

☒ Technical data and selection tables for Air-Grip, Diamond D, Rolling Grip Clutches. Bulletin D56.

☒ Taper-Lock Chain Couplings. Technical data and selection methods. Bulletin A-644.

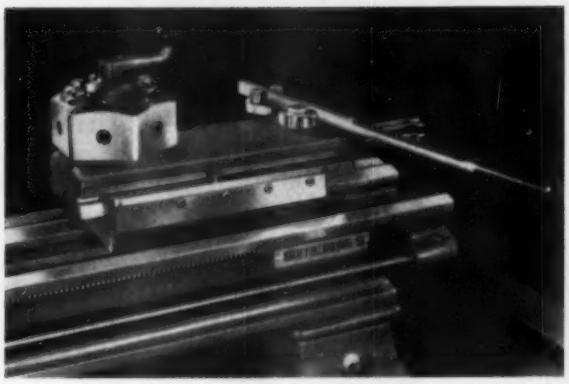
☒ Sealed-Life V-Belts. Data on sizes, pitch lengths and outside lengths. Bulletin A-606.

Write for your copy.

DODGE
of Mishawaka, Ind.
DODGE MANUFACTURING CORPORATION
100 Union Street • Mishawaka, Indiana

Simplify Repetitive Operation
WITH
SOUTH BEND TURRETS

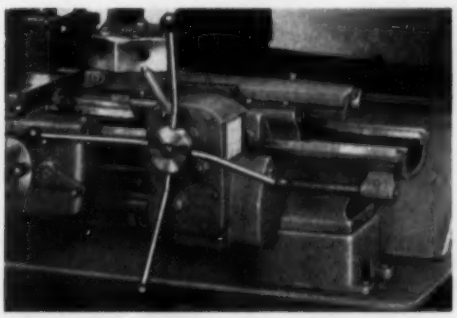
Precision-built for precision work, these South Bend Turrets simplify tooling for repetitive operations that must be held to very close tolerances. Their rigidity and accuracy permit use of maximum cuts and spindle speeds. They are representative of 165 attachments, tools and accessories that are designed for South Bend Lathes. Use them to simplify routine operations or to tool up special jobs economically. Reasonable prices enable you to do this profitably — another reason for using South Bend Lathes.



HANDLEVER BED TURRET

Mounts any place on bed. Indexes ± .0005" at 4" from turret face Hardened, ground and superfinished index pin. Indexes automatically. Automatic feed stop for each position. Effective slide feed 4". Tool holes ⅝" or ¾".

Size Lathe	Catalog No.	Price
9"	CL1611N	$284
Light Ten	CL1611K	291
10"	CL1611R	298
13"	CL1611T	320



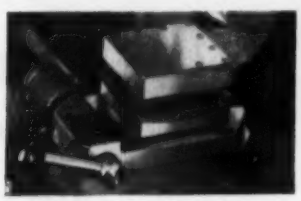
POWER FEED TURRET FOR 13" LATHE

Has independent feed trip and stop for each of the six turret faces. Effective feed of turret slide is 6½". 144 power turret feeds .0006" to .1093". Turret head indexes and locks automatically on the return stroke of the turret slide. Turret ram lock is provided. Price $726

HANDLEVER TURRET

Replaces tailstock. Index lock releases automatically. Automatic feed stops. Manual indexing of turret. Holds 6 tools with ⅝" shanks. Maximum stroke length of turret slide is 3¾".

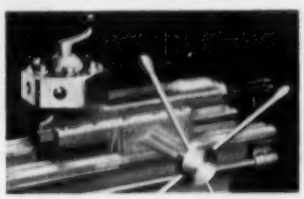
Size Lathe	Catalog No.	Price
9"	CL2045N	$120.50
Light Ten	CL2045K	128.00
10"	CL2045R	139.50
13"	CL2045T	167.50



SQUARE TURRET TOOL BLOCK
for Compound Cross Slide

Mounts 4 cutting tools. Turret indexes within .0005" to 4 positions. Quick acting lever lock.

Size Lathe	Catalog No.	Price
9" & 900	CL3375N	$47.75
Light Ten	CL3375K	50.50
10" & 1000	CL3375R	54.00
13"	CL3375T	60.75
14½"	CL3375F	87.25
16" & 2-H	CL3375H	94.50



HAND FEED TURNSTILE BED TURRET

Mounts any place on bed. Indexes ± .0005" at 4". Hardened, ground, and superfinished index pin. Indexes automatically. Automatic feed stops. Turret ram lock is provided.

Size Lathe	Catalog No.	Price
16"	CL1917H	$710
13"	CL1917T	515

All prices f.o.b. factory

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ ½" & 1" Collet TURRET LATHES ☐ TOOL GRINDERS ☐ 7" BENCH SHAPERS ☐ MILLING MACHINES

Name_____ Street _____

City_____ State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

Cut Inspection Costs

by employing the *added* accuracy and speed of a

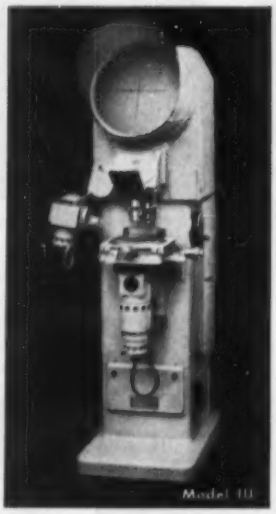
NIKON

Optical Comparator

Permits the study and measurement of surface textures as well as edge contours

A Nikon Optical Comparator permits critical examination of small objects, by projecting their magnified images onto a viewing screen. Because the magnifications are precise, the dimensions of the object can be readily derived from measurements taken of the projected image.

For example, a precise enlarged contour pattern on a translucent sheet, placed onto the viewing screen, can serve to define the tolerance limits of an object or part under inspection. Several critical points can be checked simultaneously. Errors in judgment are virtually eliminated. The most intricate contours, and minute parts, are easily gaged by this technique.



Surface Illumination

One of the important features of the Nikon Optical Comparator is the added facility for surface illumination. This permits the surface topography of any material to be closely examined—for texture, finish, corrosion, wear, etc.

Nikon Optical Comparators are equipped with lens turrets —which permit rapid interchange to selected magnifications—and with fixed adjustment positions for condensers, to provide maximum illumination efficiency at each magnification.

Bright, Even Illumination

Most impressive in the performance of the Nikon Optical Comparators are the extreme accuracy, the overall sharpness of the projected viewing image, and the even brightness of illumination. These are functions of optics, a field in which Nikon has already demonstrated outstanding achievements in the development of new optical glass techniques, photographic lenses, prism binoculars, ophthalmic and other scientific instruments.

Another attractive advantage of the Nikon Optical Comparators is their surprisingly low cost.

Nikon Bench Model Comparators are also available

For specifications and prices, write to: ZM-19

NIKON INCORPORATED 251 Fourth Avenue, New York 10, N.Y.

Stereo and Research Microscopes, Surveyor's Transits and other precision optical equipment

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.

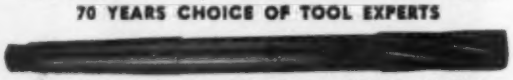
Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

ATTENTION REAMERS BUYERS

70 YEARS CHOICE OF TOOL EXPERTS



REAMERS, MILLING CUTTERS, END MILLS, SPECIALS

ALVORD-POLK TOOL CO. Millersburg, Pa.

PALMGREN Machine Vises and Rotary Tables

Used in all Industries — Everywhere

There are 66 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories — the most complete line of vises and tables available anywhere.

No. 608 6" Swivel Machine Vise, $99.95

Write for Catalog 204

No. 83 8" Rotary Table, $79.95

CHICAGO TOOL AND ENGINEERING CO. 8380 S. Chicago Ave., Chicago 17, Ill.

*W.H.O.'s ALWAYS FIRSTEST

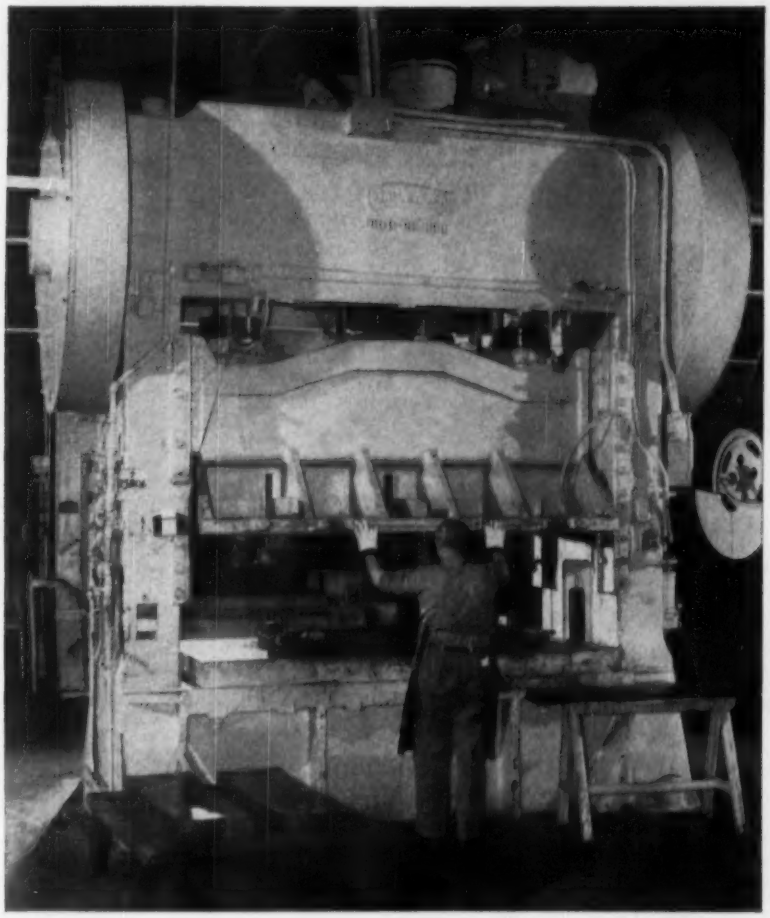
with the bestest precision screw machine products.

CAP SCREWS • COUPLING BOLTS

SET SCREWS • MILLED STUDS

. . . our specialty

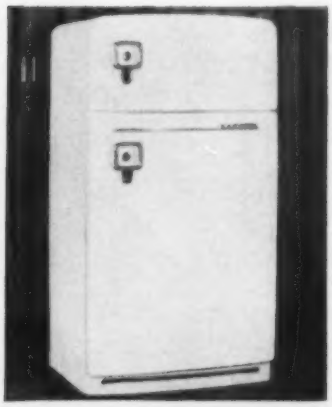
*Wm. H. Ottemiller Co. YORK, PENNA.



The Cleveland Double-Crank Press shown here draws more than seven parts for the famous Servel Refrigerator.

SERVEL, INC. finds Cleveland Presses

"require very little maintenance . . . have no clutch problems"



Installed in the Home Appliance Division of SERVEL, INC., Evansville, Indiana, in March of 1951, the Cleveland Double Crank Press you see here has been constantly "on the job" producing parts for famous Servel refrigerators.

Carl Linke, Foreman of the Sheet Metal Department, says, "This Cleveland 80D is a good press. We've used it for most of our draw work for the past five years. During this time it has required very little maintenance. We've had no clutch maintenance problems."

As have many of the nation's leading stamping departments, you, too, will find that Cleveland Presses prove themselves to be easy-to-maintain, low-cost producers. Before buying your next press be sure you have the complete Cleveland story. One of the 11 specialized types of Cleveland Presses is sure to be your answer to greater stamping economy. Write or call today!

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

POWER PRESSES – FABRICATING TOOLS

E. 40th & St. Clair Avenue, Cleveland 14, Ohio

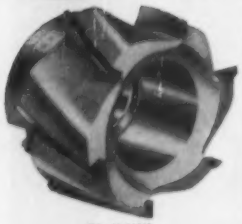
Offices at: NEW YORK • CHICAGO • DETROIT
PHILADELPHIA • E. LANSING

CITY FOUNDRY DIVISION · SMALL TOOL DEPARTMENT

6 new ways to cut floor-to-floor time!

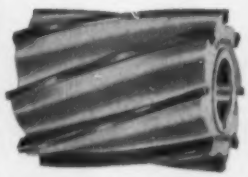
"Helicarb" milling cutters have a constant included cutting angle. The cutting load is uniformly distributed over the full length of the cutting edge. Cutters stay sharp longer, give far better dimensional control, better finishes, and greater stock removal. On many jobs, rough and finish cuts can be combined. Floor-to-floor time is drastically cut, reducing per-part cost.

These new cutters fully utilize the new advances in machine tool design. More and more shops—those that want a competitive edge—are using them. Why not you?



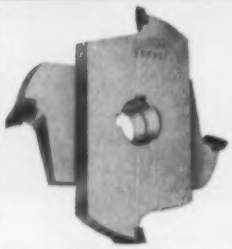
Shell Mills

End Mills

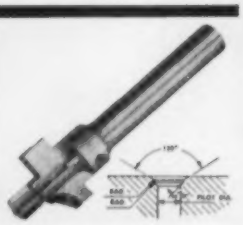


Slab Mills

Staggered-Tooth Side Mills



Interlocking Side or Straddle Mills



Attention! Hydraulic Parts Producers
If you produce A.N.D. 10050 port contours, investigate the Sonnet A.N.D. Port Contour Cutter that completes five operations in one pass!

HELICARB
TRADE MARK

The original line of standard helical carbide milling cutters.

Manufactured by Sonnet Tool & Mfg. Co., 579 North Prairie Ave., Hawthorne, Calif.

TOOL WEAR...–75%
MACHINING SPEED...+100%
ON THIS GRAY IRON RING

...thanks to

FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE...because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 13, Niagara Falls, N.Y. 24-52

CARBORUNDUM®

The modern metalworking fact you want— *when you want it!*

Great news for all concerned with metalworking! Now you can have a famous reference in entirely modernized form. THE NEW AMERICAN MACHINIST's HANDBOOK brings you today's practice—today's needed data—in profusion.

The NEW AMERICAN MACHINIST'S HANDBOOK

Edited by RUPERT LE GRAND
Senior Assoc. Ed., AMERICAN MACHINIST
Based on AMERICAN MACHINISTS' HANDBOOK by Colvin & Stanley

BIGGEST IMPROVEMENT IN NEARLY 50 YEARS!
80% rewritten
Fully up to date
1579 pages
774 illustrations
45 big sections
$11.00
EASY TERMS
FREE TRIAL!

Answers hundreds of machine shop and drafting room questions — layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances, forming and finishing, and many others. Means time and money saved—better results.

McGRAW-HILL BOOK CO.,
327 W. 41 St., N. Y. 36, N. Y.

Send me Le Grand's THE NEW AMERICAN MACHINIST'S HANDBOOK for 10 days' examination on approval. If satisfactory I will send (check one) ☐ $3 in 10 days and $2 a month until $11 is paid, or ☐ full purchase price of book. (We pay delivery cost if remittance accompanies this coupon. Same examination and return privilege.)

(Print)
Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position .....
For prices and terms outside U.S., write McGraw-Hill Int'l., N.Y.C. FA 8/27—196

From the *American Machinist* Library of *Tips for Top Shop Men*

MICROSTRUCTURE, rather than composition, may frequently be the key to successful machining of a part. Two pieces that look alike and were made alike may be entirely different in their reaction to a tool.

It's too late to check surface finish at final inspection

Overfinishing is costly—*and final!* Detecting overfinish after a part is completed can't correct it *or* restore wasted machine time. Underfinishing is also expensive because parts must be returned for re-work. Yet, checking of finish at final inspection has been common practice. In the past, only the inspector *could* make an accurate check of surface finish—not the machine operator.

On-the-spot surface finish checking was by feel or appearance. Consequently, surfaces generally were overfinished to pass inspection—far beyond any smoothness specified. Surface finish could not be measured where it was being produced—at the machine.

Weighing only 15 pounds, the Brush SURFINDICATOR is fully portable. It puts laboratory precision to work where it's needed most—at the machine.

Finish now controlled at machine

Now, Brush offers a remarkable new instrument that can be used *right at the machine*, as well as in the inspection department or laboratory. The Brush SURFINDICATOR* accurately and immediately indicates the exact surface finish produced.

Simple to use

The SURFINDICATOR can be used by anyone. The hand-held stylus is simply passed over the surface in question, and an accurate measurement in micro-inches is instantly obtained. It permits the machinist to check his work *as he works*, and provides him with a guide for further finishing. Fully portable and ruggedly built, it can be used anywhere in the plant, anytime.

The Brush SURFINDICATOR provides accurate surface finish control wherever needed—on metals, glass, plastic, paper, wood and other surfaces for maximum finishing economy.

Write for your free copy of this informative new booklet on surface finish control . . . it includes new ASA standards for surface roughness, waviness and lay.

It is important that you get complete information at once on the Brush SURFINDICATOR together with the new ASA standards for measuring surface smoothness. Both are contained in the new booklet offered—write for it today! *T.M.

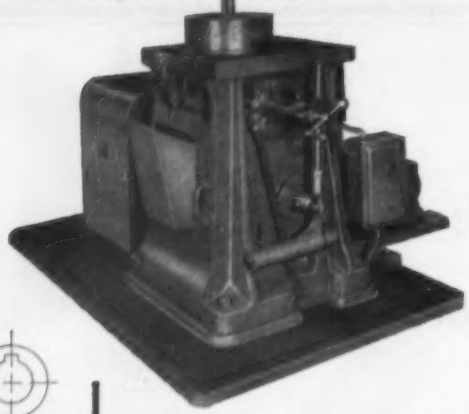
BRUSH ELECTRONICS COMPANY

3505 Perkins Avenue, Cleveland 14, Ohio

BRUSH ELECTRONICS

DIVISION OF CLEVITE CORPORATION

M&M giant keyseaters



M & M Giant Keyseaters cut internal keyways or splines in the bores of pulleys, gears, flywheels and other machine parts. Fast, accurate operation. Built in a wide range of sizes. Special fixtures and cutters available for unusual shapes and taper work. Write today for complete information.

MITTS & MERRILL

104 Holden Street • SAGINAW, MICHIGAN

83

Wolverine

Heavy Duty

QUICK ACTION TOGGLE CLAMPS

Extra CLEARANCE
Extra SPEED

and now ***Extra SERVICE*** assured by the use of

HARDENED PINS & BUSHINGS

at all bearing points, in the popular C-100, CQ-1100, and CQ-800 series Toggle Clamps.

Rugged construction—drop forgings, cast steel and solid bar stock.

Wolverine Toggle Clamps also available in several types and sizes of Standard Action and Push Action units.

Write for Bulletin

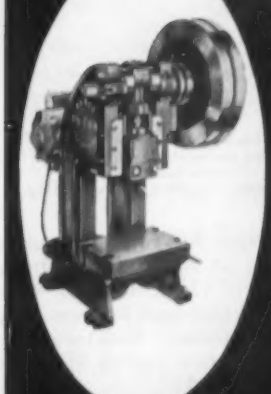
WOLVERINE TOOL CO.

1484 E. WOODBRIDGE
DETROIT 7, MICHIGAN

KENCO

1½ TO 15 TON

PUNCH PRESSES



PRECISION-BUILT FOR FAST, TROUBLE-FREE PRODUCTION

Here at last is a complete line of small punch presses built to big press standards. You get rugged construction throughout . . . minimum need for adjustments . . . minimum downtime . . . capacity far beyond the ratings . . . steady, economical production.

Write for literature and engineering data.

Trouble-free crankshaft has no weakening slots . . . eliminates driving dog breakage. One-piece, alloy steel construction.

Flywheel driving plate is hardened and ground, assuring long wear and positive drive—a quality feature exclusive with KENCO presses.

KENCO MANUFACTURING CO.

Mfrs. of Precision Machinery and Accessories

5211 Telegraph Road
Los Angeles 22, California

If your production calls for **PRECISION HOLES** in volume—

(any size from ⅛" to 10" dia.)

This gage is FOR YOU

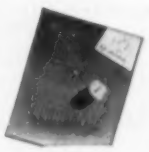
USERS INCLUDE:

Airesearch Mfg. Co.
Allison Div.
Apex Electrical Mfg.
Buick Motor Div.
Century Electric Co.
Chicago Pneu. Tool
Chrysler Corp.
Continental Motors
Curtiss-Wright
Detroit Transmission
Douglas Aircraft
Fairchild Engine & Airplane Co.
Falk Corp.
Ford Motor Co.
General Electric Co.
Hamilton Standard Division
Harris Seybold Co.
Homelite Corp.
Int. Harvester Co.
Jacobs Mfg. Co.
Lycoming-Spencer Div.
McDonnell Aircraft
National Lead
Northrop Aircraft
Pontiac Motor Div.
Scintilla Magneto
Steel Products Eng.
Studebaker-Packard
Sylvania (Atomic Div.)
United Airlines
Warner Gear Div.

- Measures precision bores to fractions of .0001".
- True 2-point gaging aligned and centered automatically.
- Shows ACTUAL SIZE in a fixed – not passing – reading.
- Reveals ovality, front or back taper, bell mouth, etc.
- No training program needed, anyone can use accurately.
- Self-contained – no wires, hose, or electronic gear.
- Widely used in Statistical Quality Control programs.

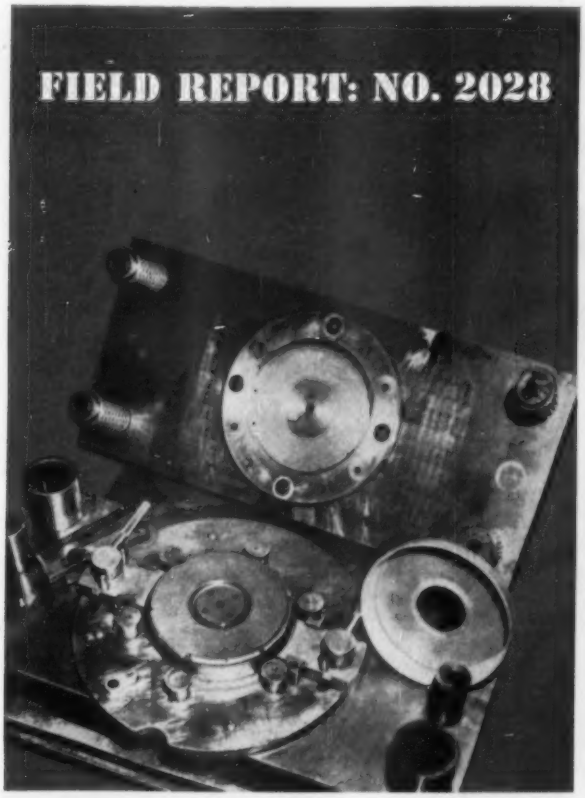
SEND FOR BULLETIN 49

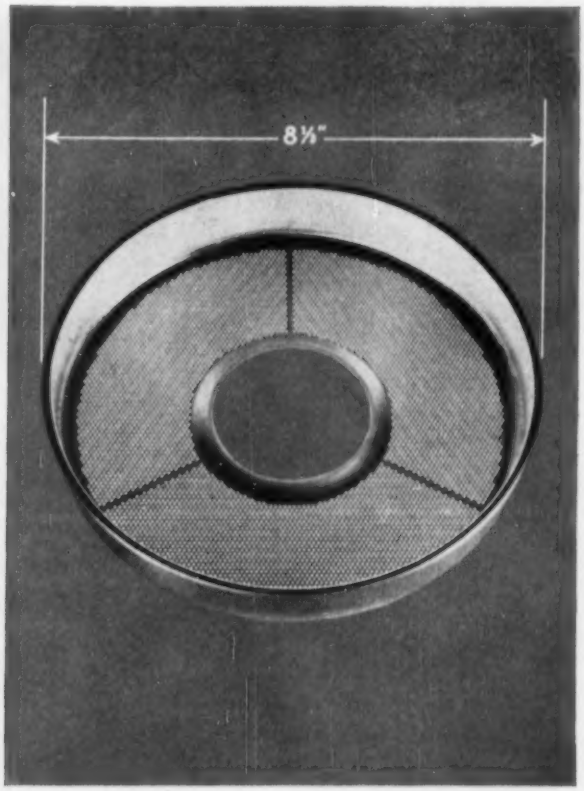
Shows complete details of operation, application and unique advantages.



COMTOR COMPANY

68 FARWELL ST., WALTHAM 54, MASS.





WHICH DIE STEEL WOULD YOU USE

to be sure of getting 6,066 perfect holes in this die?

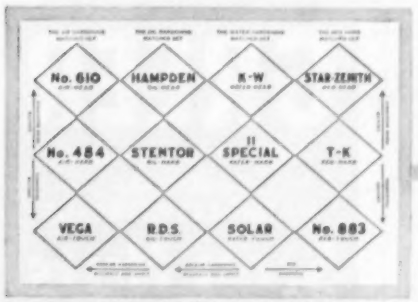
These tools are used in a 60-ton press to pierce 6,066 holes of .036" dia. in aluminum filter pans for a popular home appliance. The job demands "almost everything" from the die steel . . . good machinability and uniformity, minimum size change, extra safety in hardening and toughness to withstand heavy press loads.

The filter pans are 8⅓" in dia., and .025" thick. The 6,066 holes are perforated in three blows, as the die moves through three 120 degree indexing stations. Hundreds of machine hours are involved in drilling and taper reaming the tiny holes.

If the decision were up to you . . . on which die steel would you be willing to stake your reputation in view of this tough set of requirements?

In this Field Report from customer files, here are the amazing results: Working with Carpenter VEGA (Air-Tough) Die Steel, the company reports that not a single "hard spot" was encountered . . . *all 6,066 holes are in the die as planned.* The machining of VEGA was "considerably easier" than the machinery steel used for the stripper plate. What's more, there was no discernible change in size or shape after heat treatment . . . *the die held perfectly!*

You can count on good results from any Carpenter Matched Tool and Die Steel. Take the risk out of your tough tooling jobs. Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor now for immediate delivery.



® U. S. Patent Office, The Carpenter Steel Co., Reading, Pa.

Carpenter STEEL

Matched Tool and Die Steels

The Carpenter Steel Company, 109 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

YESTERDAY...

Button shoes and Taps were inefficient

TODAY...

"CONTROLLED TAP SHARPENING" can make each tap one of your most efficient cutting tools.

BLAKE Flute and Chamfer Grinders can reduce your tap costs over 60%, and assist you in meeting tighter standards on fits by creating or restoring:

1. Exact indexing of cutting edges.
2. Best rake or hook angle.
3. Correctly ground spiral points.
4. Perfectly relieved chamfers.

NEW—AIR OPERATED VERTICAL SLIDE Now Available on BLAKE Flute Grinders. This is the greatest advance in tap sharpening since the BLAKE Flute Grinder was introduced, giving you *faster* tap sharpening with *smoother* finish for still *longer* tap life! Present machines in use can be converted to Air Operation of the Vertical Slide.

Write for details NOW!

EDWARD **BLAKE** COMPANY INC.

MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS

435 CHERRY ST., WEST NEWTON 65, MASS.

Exclusive Distributors of:
BLACK DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS • WORCESTER DRILL GRINDERS

ANCHORED FOREVER

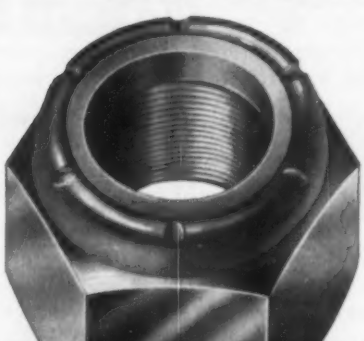
. . or Released in an Instant

Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts *never* work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study *your* fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

Write
GREER STOP NUT CO.
2620 Flournoy Chicago 12, Ill.



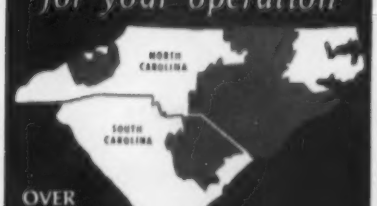
GREER

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF

Stop Nuts

THE RIGHT LOCATION

for your operation



OVER 350 COMMUNITIES TO CHOOSE FROM

(Address S. P. Vecker, vice President Area Development Dept)

Carolina Power & Light Co.

RALEIGH / NORTH CAROLINA

CSI CALIBRATOR FOR DIAL INDICATORS

Model CS-75

THE DIAL INDICATOR CALIBRATOR is used to check and calibrate the accuracy of dial indicators and production checking of pieces having a number of different diameters. The range is 0 to ½" travel of CW or CCW indicators. Direct reading is to .000025". Standard unit set for AGD stem on indicators. (Pat. applied for).

Folders and Price upon request.

CUSTOM SCIENTIFIC INSTRUMENTS, INC.
541 Devon Street, Kearny, N. J.

BATH PRESSES can TAKE IT... Around the Clock!

The Fort Steuben Metal Products Co., Follansbee, West Virginia specializes in the fabricating of anything in the metal shelving line.

Mr. Albert W. Robinson, Vice President of the Fort Steuben Metal Products Company has this to say about Bath Presses:

"Here at Fort Steuben we are more than satisfied with the way Cyril Bath Presses have demonstrated their ability to take it. Operating as we do, sometimes around the clock to keep up with demand for our shelving, we require dependable, rugged equipment. This ruggedness, coupled with large bed area for dollars expended, plus ease of operation and maintenance makes Cyril Bath Presses ideal."

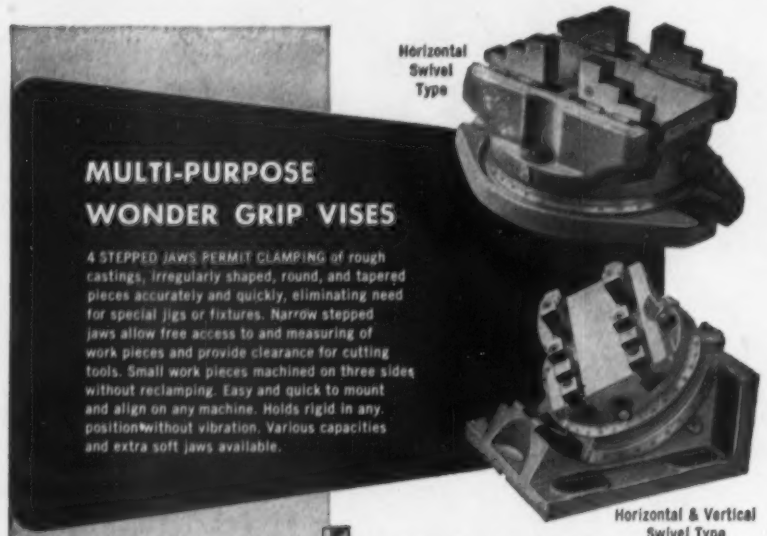
Catalogs are available, without obligation, covering both The Cyril Bath Power Press Brake and P.T. Press line . . . this literature covers important information regarding the features which make BATH Presses your best buy . . . and ask for the Power Press Brake Die Catalog too!

THE CYRIL BATH COMPANY

32340 AURORA ROAD • SOLON, OHIO

(LOCATED IN THE GREATER CLEVELAND AREA)

Manufacturers of Radial Draw Formers • Dies • Tools • Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines



MULTI-PURPOSE WONDER GRIP VISES

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Easy and quick to mount and align on any machine. Holds rigid in any position without vibration. Various capacities and extra soft jaws available.

TAPPING ATTACHMENTS

Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout by long established reputable West German factory.

DISTRIBUTOR INQUIRIES INVITED

Also United States Distributors of European Machine Tools

Tested for Performance to High Amer. Standards
Immediate Delivery from N.Y. Stock

MADE IN GERMANY

Low Competitive Prices

- **Quick Change Chucks and Collets**
- **Wille-Grip Keyless Drill Chucks**
- **Milling Machine Arbors, Adapters, Arbor Spacers and Bearings**
- **Lathe Mandrels**

MBI

Our Headquarters in New York City

Write for complete details and prices to Dept. 20

M.B.I. EXPORT & IMPORT LTD.

A Division of Machinery Builders Inc.

475 Grand Concourse, Bronx 51, N. Y.

"Over 20 years experience in designing and building machinery"

CABLE ADDRESS: Machbuild New York

Phone: MOtt Haven 5-0900

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, *where large work belongs*. You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

LINLEY BROTHERS CO.

664 STATE ST. EXT., BRIDGEPORT 1, CONN.

Published only by American Machinist

How to Work STEEL

NOW—This 128-Page Special Report Is Available In Reprint Form

The supply is limited, but there is still time for you to order complete copies of this remarkable report. If you saw the *How to Work Steel* section in your 1955 Production PLANBOOK issue of *American Machinist* . . . you know every production executive and engineer in your shop can make profitable use of the information it covers.

Nowhere else can you find so much up-to-date and concise data on each type of steel, its properties, and the best techniques for all working methods. Most of this information, you may recall, is what often is called "handbook" data—standard and accepted procedures. But *How to Work Steel* is more current than any handbook. And this report gives you the facts you want fast. An easy-to-follow index classifies the heat-treating, machining, forming, and forging, as well as finishing methods, for each important type of Metalworking's basic material: cast iron, cast, wrought, stainless, and tool steel. In addition, these operations are illustrated profusely with invaluable graphs, diagrams, and tables.

For prompt, personal service, place your order today for one or more copies. $.50 each.

READER SERVICE DEPT.

American Machinist

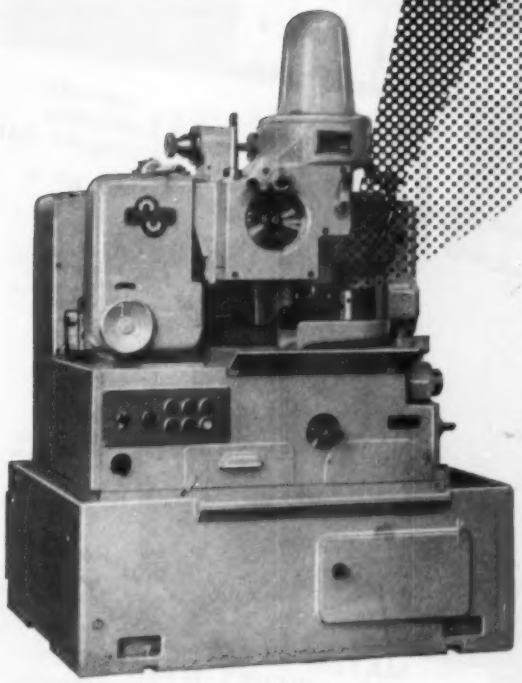
McGRAW-HILL BUILDING

NEW YORK 36, N. Y.

GEAR SHAPING MACHINES

for economical manufacturing of all profiles that can be generated, as:

EXTERNAL- AND
INTERNAL GEARS
RACKS
CROWN WHEELS
RELIEF SHAPING
CLUTCH GEARS



LORENZ

GEAR HOBBING MACHINES

in progressive development
for more than 60 years

MASCHINENFABRIK LORENZ AG · ETTLINGEN/BADEN

* SILICONE DEFOAMERS boost production

If excessive foaming is handicapping your production, try a Dow Corning defoamer. The most versatile defoamers ever developed, these silicone foam killers act quickly against even the most violent and persistent foamers. For example:

> The coolant in the camshaft grinder shown above foamed so badly it kept output low and occasionally halted production by overflowing on equipment and floors in the surrounding work area. This costly production - maintenance problem was eventually solved by simply adding a single teaspoonful of Dow Corning Antifoam A Emulsion to the grinder's 300 gallons of coolant. That's less than 2 parts per million!

Now available . . . Metalworkers everywhere already acclaim Dow Corning's new *Antifoam B* the most convenient and economical defoamer for coolants ever developed! No pre-mixing, no agitating, it stays dispersed indefinitely.

Learn how to kill foam economically and boost your production.

Write for
FREE SAMPLE AND LITERATURE

DOW CORNING SILICONES

Dow Corning Corporation, Dept. 0312
Midland, Michigan
Please send me: free
information and sample of Antifoam B.

NAME _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

cost problems?
better check . . .

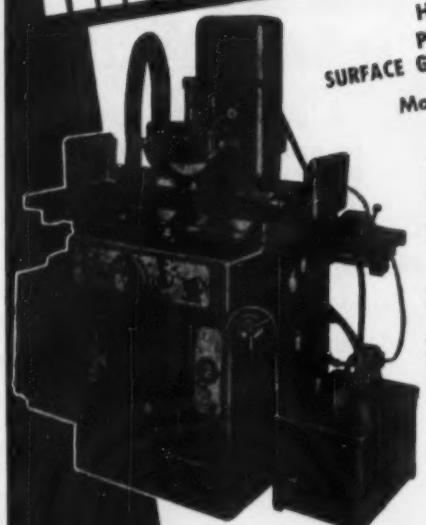
BEATTY
METAL WORKING EQUIPMENT

Take the high costs out of "short order" punching — save up to 75% on some metal fabricating jobs with these versatile Beatty punches, featuring built-in adjustable tools. **GUILLOTINE BEAM WEB PUNCH** (left) has 6 individually controlled punching units with automatically synchronized punch and die. Handwheel on **GUILLOTINE BEAM FLANGE PUNCH** (right) changes punching centers and synchronizes punch with die. Four punching units. Spacing tables supplied for either machine.

Write: BEATTY 948 150TH ST., HAMMOND, IND.

MATRA

Hydraulic
PRECISION
SURFACE GRINDING MACHINE
Model MF 6



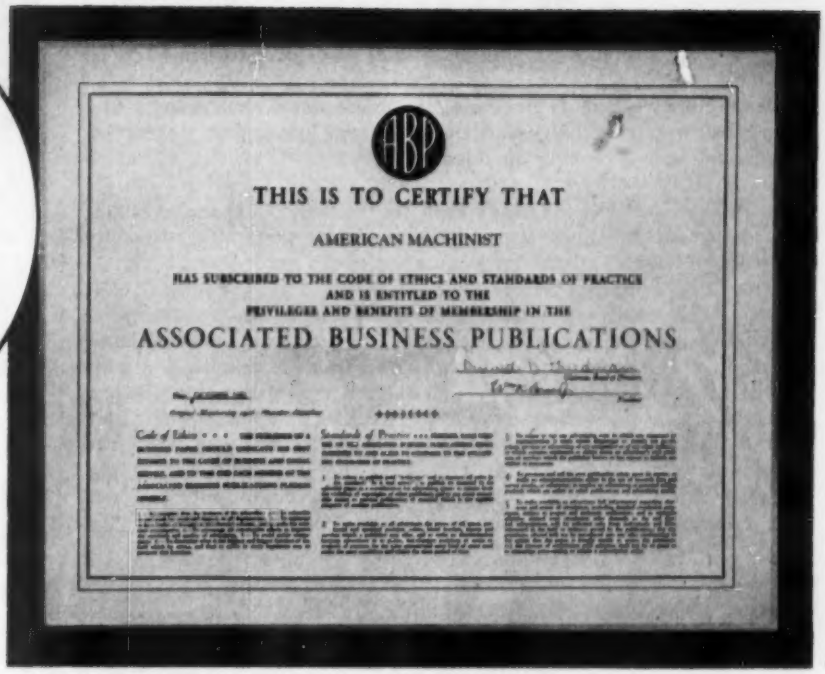
for grinding of: horizontal and vertical surfaces, slots, keyways, guideways, forms, devices etc.

Max. grinding
Length 24"
Width 8"
Grinding Spindle
Speed 2800 r.p.m.

Please ask for our Special leaflet

MATRA-WERKE • GMBH
FRANKFURT/MAIN 301
WERKZEUGMASCHINEN UND WERKZEUGFABRIKEN
GERMANY

"TO CONSIDER **FIRST** THE INTERESTS OF THE SUBSCRIBER"


THIS IS TO CERTIFY THAT
AMERICAN MACHINIST
HAS SUBSCRIBED TO THE CODE OF ETHICS AND STANDARDS OF PRACTICE
AND IS ENTITLED TO THE
PRIVILEGES AND BENEFITS OF MEMBERSHIP IN THE
ASSOCIATED BUSINESS PUBLICATIONS

American Machinist is an active member of the Associated Business Publications which this year is celebrating its Golden Anniversary. We take this opportunity proudly to re-affirm our belief in the high publishing principles for which the Association stands and to assure our readers that we will ever "consider, *first*, the interests of the subscriber."

THIS WE BELIEVE...

The publisher of a businesspaper should dedicate his best efforts to the cause of business and social service, and to this end each member of the Associated Business Publications pledges himself:

1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To endeavor to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To encourage all constructive efforts to improve the standards and quality of advertising.
5. To avoid unfair competition.
6. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

American Machinist

Gaging . . .

the Surplus Machinery Market

Tight money pinch is beginning to make itself clear across the country, but it's an ill wind that blows no good, and leasing of machine tools is picking up steadily.

In spite of the lack of ready cash for industrial expansion, sales of used machine tools are picking up pretty generally, although they still haven't reached first quarter levels.

Dealers generally are optimistic about the next three-to-six months, figuring that any dealer who has a stock of good-quality, late-model machines on tap, and who isn't afraid to get out and sell, will be able to make out pretty well for himself in the coming months. The man whose showroom is full of "junkers" won't find the going quite as smooth. Most customers today don't want just another beat up lathe or drill press in the shop. They're looking for machine tools that will help them turn out quality product at a lower cost, and they don't mind paying for them.

Auctions still seem to be the exception to customers' current choosiness in machine tool buying. Auctions are still raking in sky-high bids for untested machines — higher prices than guaranteed equivalent machines are bringing at established dealers.

It's reported that at the recent Motor Products Co auction in Detroit a big group of punch presses sold fast at unusually high prices. This is surprising because a large number of units in a lot generally tends to depress auction bids. It's also reported that some of the machine tools auctioned at Motor Products brought 90 to 95% of new machine catalog prices.

Here and there across the country, some scare buying on the part of used machinery dealers is being reported for the first time.

It seems that a few dealers are adding heavily to their stocks just in case the Middle East situation develops into another "police action" like Korea. As one dealer puts it, "They're adding to their stocks as if the machine industry was about to shut down and no more machine tools would be made."

Here's how the market lines up generally across the country: heavy machines, particularly for turning operations, are in top demand; demand for radials, which has been high for a long time because of their scarcity, is staying 'way up; some sizes of surface grinders and millers suitable for toolroom work are moving fast, so for that matter is almost any type of toolroom equipment; sales of used sheet-metal fabricating units have slacked off somewhat. Production machines are moving fairly well.

The big metalworking plants are doing the lion's share of used machine tool buying at the moment. They're not feeling the credit pinch nearly as much as the smaller plants.

One result of the tight money situation, as reported from the West Coast, where small electronics firms and aircraft subcontracting shops abound, is that a large number of customers are looking for low down payments and special financing arrangements as an alternative to conditional sales contracts.

United
EVERY TIME!

GEAR EQUIPMENT
BARBER COLMAN Type S Hobber
FELLOWS 12" Helical & Spur Shaper
FELLOWS 64A Int. & Ext. Spur—1943
GLEASON 12" Straight Bevel Generator

CYLINDRICAL GRINDERS
NORTON 14"x36" Type C Plain--1942
CINN. 6"x18" Model ER Semi-Auto.—Filmatic
NORTON 6"x30" Type C Hydr. Plain
B & S #2 Univ.

SURFACE GRINDERS
COVEL #20 6"x18" Hor. Hydr.
NORTON 6"x18" Hor. Hydr.
NORTON 6"x18" Vert. Hydr.
THOMPSON 12"x18"x60" Hydr. Hor.
HILL-ACME 18"x72" Hydr. Hor.

ENGINE LATHES
AMERICAN 36"x60" High Duty—1940
REED PRENTICE 20"x78" 16-Speed
AMERICAN 12"x30" High Duty

TURRET LATHES
B & O #7 2½" Chucking
B & O #2 1" Geared Electric Head
GISHOLT #4 2" Bar & Chuck
GISHOLT #3 1½" Bar
GISHOLT #5 2½" Ram Bar

MILLERS
B & S 2B Hi-Speed Plain
B & S 3B Hi-Speed Plain
VAN NORMAN #12 Tool Room
K & T 3H Vert.
K & T 2H Plain
K & T 2HL Swivel Hd. Vert.
VAN NORMAN #22LU Univ.
P & W 6x60 Thread Mill

PRODUCTION MILLERS
CINN. #06 Plain
CINN. #2-18 R & F Cam Roller
CINN. #4-36 Hydromatic, 2-way cycle
K & T 18-54 Simplex

SHAPERS
MOREY 12" Vertical
GOULD & EBERHARDT 14"
HENDEY 16"
HENDEY 20"

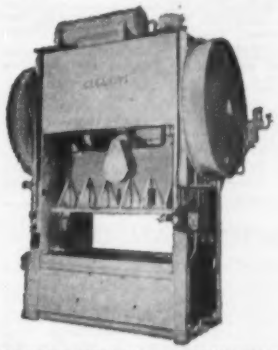
MISCELLANEOUS
GRAY 36"x36"x12' Double Housing Planer—1942
INGERSOLL 42"x42"x14' Double Housing Adj. Rail Planer Type Milling Machine, 4 Heads—1940
LaPOINTE HP 5 2½ Ton Hor. Hydr. Broach—1947
SIP 2C Jig Borer

United
MACHINERY & TOOL
CORPORATION
83 THOMAS STREET
WORCESTER 8, MASS.

WORLD'S LARGEST STOCK

STAMPING PRESSES

BLISS • CLEARING • CLEVELAND
FERRACUTE • HAMILTON • L & J
NIAGARA • TOLEDO • V & O



SQUARING SHEARS • PRESS BRAKES

REBUILT and GUARANTEED

JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34 PA Phone GArfield 3-8700

EXCELLENT USED MACHINE TOOLS

No. 5 Abrasive 12"x60" surface grinder, horiz. spdl.

No. 2 Standard Brown & Sharpe vertical mill, new 1943.

No. 3 Gisholt ram type universal turret lathes (2), new 1942.

No. 5 Gisholt ram type universal turret lathe, new 1940. Arr. bar & chucking.

Models BL2416-BL3616 F & W Keller machines (2) one late

14" x 42" cc Hendey toolroom engine lathe, new 1940.

No. 5-48 Cincinnati hydromatic duplex mill, late

No. 4 Cincinnati high-power plain horizontal mill, serial E506J.

No. 4 Gallmeyer & Livingstone universal tool & cutter grinder, new 1941.

5' arm 13" col. Fosdick "Economax" hydraulic radial drill, new 1943.

Free Illustrated Catalog of 1000 Machine Tools

MILES MACHINERY COMPANY
2039 E. GENESEE AVE.
SAGINAW, MICHIGAN
Telephone 2-3105

PRACTICALLY NEW PRESSES

Bliss No. 7-84, cap. 200 ton, Bed 50"x84".
Bliss No. 9-96, cap. 400 ton, Bed 96"x60".
Niagara No. 610E, cap. 160 ton, Bed 72"x42".
Bliss No. 5½-48W, cap. 120 ton, Bed 48"x30".
Bliss-Toledo No. 63½J, cap. 140 tons, Bed 108"x 48".
Bliss 93½ H. Bed 84"x30", cap. 140 tons.
Bliss No. 27-84, Gap Frame, cap. 200 ton, Bed 24"x100".
Cleveland No. 65D96, cap. 150 ton, Bed 96"x48" str. 8"

All Machines have Air Clutch and some have Air Cushions and Motor Driven Ram Adjustment. Still set up in Plant
"If it's machinery; we have it."

NATIONAL MACHINERY EXCHANGE
138 Mott St., N. Y. CAnal 6-2470

Quality . MOREY . *Value*

RELIABLE MACHINE TOOLS FOR HALF A CENTURY

GEAR EQUIPMENT—Fellows

FELLOWS No. 6 gear shaper; M.D. late
FELLOWS No. 4T Thread Generator; 4"x18"; late
FELLOWS No. 61A High Speed Gear Shaper; cap. 18" late type
FELLOWS No. 6Z2 High Speed Gear Shaper; late
FELLOWS No. 612 High Speed Gear Shaper; late
FELLOWS No. 624A High Speed Gear Shaper; late
FELLOWS No. 645-A Gear Shaper; late type
FELLOWS type 645-A3 High Speed Gear Shaper
FELLOWS No. 7 High Speed Gear Shaper; late
FELLOWS No. 7A High Speed Gear Shaper; late
FELLOWS No. 72 High Speed Gear Shaper; late
FELLOWS No. 75 High Speed Gear Shaper; late
FELLOWS No. 710 High Speed Gear Shaper; late
FELLOWS No. 7125 High Speed Gear Shaper; late
FELLOWS No. 77 Gear Shaper; late type
FELLOWS No. 13LS Lapper; late type
FELLOWS 4-T Thread Generator; 4"x12" table
FELLOWS #24 Involute Measuring Machine; late

GEAR EQUIPMENT—Gleason

GLEASON No. 1 Flame Hardener; late type
GLEASON 3" Straight Bevel Gear Gen. late
GLEASON No. 6 Revacycle; late type
GLEASON No. 12 Tool Sharpener; late
GLEASON 12" Straight Bevel Generator; for Roughing & Finishing; late type
GLEASON No. 12 Straight bevel gear Rougher; M.D., late type
GLEASON No. 12B "Coniflex" Gear Generator
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 19" spiral bevel, cutter sharpener; M.D.
GLEASON No. 14 Spiral & Bevel Hypoid Gear Grinder; M.D.
GLEASON 15" Spiral Bevel Finisher
GLEASON No. 15 Quenching Press; late
GLEASON 25" Quenching Press; late type
GLEASON No. 18 Gear Tester & Lapper; M.D.
GLEASON 24" Bevel Gear Planer; M.D.
GLEASON 37" Straight Bevel Gear Planer
GLEASON 54" Spur & Straight Bevel Gear Planer

GRINDERS—SURFACE

BILLITER & KLUNZ 48"x186" Way Grinder
BLANCHARD No. 11 Rotary; cap. 36" dia. M.D.
BROWN & SHARPE No. 2; motor drive; late
BROWN & SHARPE No. 2; NEW
HANCHETT 36"x120" Wheel Grinder; late
HEALD No. 22 Rotary; 12" chuck; M.D.
HEALD No. 25A Rotary; 30" Chuck; late
MATTISON 14"x16"x60" Hydraulic Surface Grinder
MATTISON 14"x24"x72" Rotary late type
MATTISON 16"x24"x120" High Power; late type
NORTON 6"x18" Vertical and Horizontal; late
PRATT & WHITNEY "B" 14"x36" Vert.; late

LATHES—Turret

GISHOLT 1L Univ. Saddle type; Timken; late
GISHOLT 2L Univ. Timken; late type
GISHOLT No. 3 Univ. M.D.; late type
GISHOLT No. 5 pre-selector head; late
LIBBY 4H-12; 12" hole; M.D.; late type
MOREY No. 2 ram type, Timken; latest type
MOREY No. 4 Univ. ram type; latest type
POTTER & JOHNSTON No. 8DT Automatic Chucking & turning; late type
WARNER & SWASEY No. 1 Electric; late
WARNER & SWASEY No. 1A Universal; for chucking work
WARNER & SWASEY No. 2A Universal, for chucking; M.D.; late type
WARNER & SWASEY No. 4 Univ., pre-selector head; late type

MILLING MACHINES

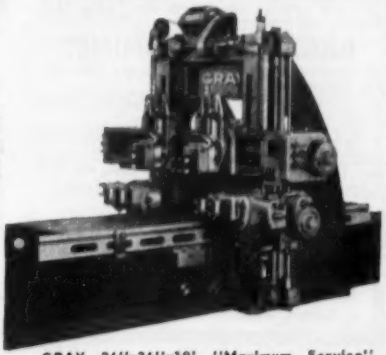
BROWN & SHARPE No. 2 "Light Type," PRT, Timken; late type
BROWN & SHARPE No. 12 electrically controlled; late type
CINCINNATI 2-24 Automatic; Timken; M.D.
CINCINNATI 2-24 Hydr. rise and fall; Timken
CINCINNATI No. 4 High Power; Dial Type; High Speed; M.D.; New 1952
CINCINNATI No. 5-48 tracer controlled; Hydr.
KEARNEY & TRECKER (Milwaukee) No. 2H; Timken Bearing; late type
KENT OWENS; table 22"x9"; M.D.; late
ROCKFORD No. 3 "Rigidmil"; motor drive
STARR No. 2 Table 13"x55"; late type
SUNDSTRAND No. 33 Plain; late type

MILLING MACHINES—Vertical

BRIDGEPORT ½ H.P.; table 9"x36"
BROWN & SHARPE No. 2 Light Type Vert.
CINCINNATI 0-8 Vertical, Timken; late
CINCINNATI No. 2M Vertical; late type
CINCINNATI No. 3; dial type; high speed or medium speed; Timken; late type
KEARNEY & TRECKER "Milwaukee" Model 2KM Timken; latest type
KEARNEY & TRECKER (Milwaukee) Model CSM high speed; Timken; power rapid traverse
REED PRENTICE No. 3 PRT; Timken; late

PLANERS

GRAY 48" x 48" x 10' "Maximum Service"; 4 heads; Power Rapid Traverse; D.C. Reversing
LIBERTY 144"x76"x48" adj. openside; 1 table; 4 hds.; vari-voltage; Power Rapid Traverse; M.D.; late type; NEW 1940
NILES 48"x48"x10' double 4 hds., PRT M.D.
NILES BEMENT POND 72"x72"x30"; 4 hds.; Power Rapid Traverse; D.C.; M.D.
NILES BEMENT POND 60"x60"x14' doube housing; late type
SELLERS 48"x48"x14' Double Housing; late type
SOUTHWARK No. 1; 10' Plate Edge Planer



GRAY 36"x36"x10' "Maximum Service" Planer; 4 Heads; PRT; Reversing DC Motor Drive.

PRESSES

BESCO Model M18; OBI; cap. 18 tons; new
BESCO Model EB2, 18½-ton Back Flywheel New
BIRDSBORO 325-ton, 81"x31" bot. uprights
BLISS No. 410A, 525-ton double action toggle drawings press; M.D.
NATIONAL No. 5 "Maxi-Press" 1,800 ton cap., H.S. Forging Machine; M.D.
NIAGARA No. 66E, 35-ton Press; late
V & O No. 3 30-ton O.B.I. Press; late
WATERBURY FARREL No. 9, 125-ton cap. Blanking Press; M.D.

CASH • CREDIT • RENTAL • TRADE-IN

SCREW MACHINES—AUTOMATIC

ACME-GRIDLEY 2" RB 6-spindle Automatic Screw Machine; New 1955
BROWN & SHARPE model 00G; late
CLEVELAND 3½" model A single spindle
CONOMATIC 1⅞", 8-spindle; late type
CONOMATIC 4⅝", 4-spindle; late type
GREENLEE 1⅝", 6-spindle; late type
GYROMATIC Model 40, 1" 6-spindle; late
NEW BRITAIN #836 Automatic Chucking Machine; late type

SHAPERS & SLOTTERS

CINCINNATI 20"; Heavy duty—horizontal; M.D.; late
CINCINNATI 24"; Heavy duty—horizontal; M.D.; late
CINCINNATI 24" Standard Duty Horizontal; late
GOULD & EBERHARDT 24"; Horizontal; M.D.
GOULD & EBERHARDT 32" "Invincible" Model horizontal; M.D.
HENDEY 12" Universal Horizontal; High Speed
ATLAS 7" Shaper; length of ram stroke ½" to 7"
MOREY 8" Vertical Shaper; late type
MUIR 6" Vertical Shaper
PRATT & WHITNEY 6" Vertical Shaper Model B
PRATT & WHITNEY 10" Vertical Shaper; M.D.
ROCKFORD 20" Hydraulic Horizontal; late type
ROCKFORD 36" Openside—Hydraulic 2 heads; late
STEPTOE 14" Horizontal; M.D.
MANVILLE #1 Auto. Screw Slotting cap. 3/16" dia., 1¼" length; M.D.
NEWTON 15" Vertical Slotter; M.D.

*PARTIAL LIST. Ask for catalog!

FREE PARKING for CUSTOMERS on PREMISES

MOREY MACHINERY CO. INC.

MANUFACTURERS • MERCHANTS • DISTRIBUTORS OF MACHINE TOOLS

387 LAFAYETTE STREET — **NEW YORK 3, N.Y.**
TELEPHONE—ALGONQUIN 4-6560 — **CABLE-WOODWORK N.Y.**

SEARCHLIGHT SECTION

SEARCHLIGHT SECTION

BUY FROM STOCK Telephone BAKER 5-5887

FALK MACHINERY COMPANY

10 WARD ST. ROCHESTER 5 N. Y.

Every Item Guaranteed as Represented

LATHES

24" x 12' BOYE & EMMES Grd. Head, Timken Bearing, Taper Attachment.

4 DE POTTER & JOHNSTON Automatic Turret Lathes, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No 2, 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking, Late Type.

17" x 8' LeBlond Regal Grd. Hd. Lathe, M.D.

DRILLING MACHINES

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

3', 4', 5', 6' CINCINNATI BICKFORD Radial Drills.

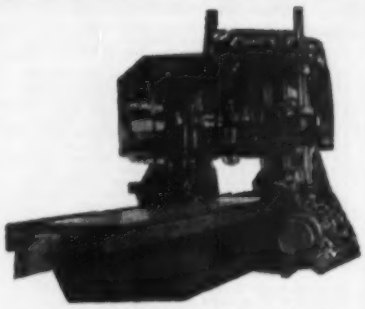
6 Spindle No. 2 LMS Leland-Gifford Drill Press. Late Type.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press. Individual Motor Drive. Late Type.

MILLS

0-8 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

1A PRATT & WHITNEY Jig Borer, with Gauges, Rods, Collets and Chuck.



No. 2HL Kearney & Trecker Horiz. Mill, M.D., Late Type

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late.

42" by 36" x 12" INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

48"CINCINNATI Duplex Automatic Prod. Mill, M.D.

No. 2, 3, 4, 5 CINCINNATI HI Power Horiz. Mills, M.D.

PRESSES

A3½ NIAGARA OBI Press, M.D., 56 tons.

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Drives.

400 Tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.

GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder, Complete Tooling.

4' x 12' LANDIS Hydraulic Plain Cylindrical Grinder, M.D. Late Type.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 W HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

47 SELLERS Tool Grinder, M.D. Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 8LS FELLOWS M.D. Gear Lapping Machine, Detachable Head, Univ. Work Support.

1AA, 3A, 4A, 5½B, 7B ROCHESTER High Speed Rivetting Hammers & Staking Machines.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, M.D. Late Type.

No. 6 BROWN & SHARPE Automatic Screw Machine, M.D., 2" Capacity.

8' x 18 Ga. Wysong & Miles Foot Shear, Late

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D

12" PRATT & WHITNEY Vertical Shaper, Keller Attachment, Late Type.

15' x 10' x 36' BETTS Double Housing Planer, 4 Swivel Heads, Pendant Control, Box Table, Motor Driven.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

HILL-CLARKE

BEST BUY OF THE MONTH

BEST BUY OF THE MONTH

No. 18 Blanchard Vertical Surface Grinder, 30" Magnetic Chuck, 35 H.P. 440-3-60 Motor Drive, 2 H.P. A.C. Table Motor Drive, Work Range 30" x 12", 18" Dia. Wheel Speed 720 R.P.M., 6 Chuck Speeds 6-33 R.P.M. Wheel raised or lowered by hand or power, Serial #2658 OUR PRICE $6950.00.

PARTIAL LISTING BORING MACHINES

Foote-Burt Vert. 26" sw. new 1941
#40 Heald Borematic, new 1944
3½ Bar Cinn.-Gilbert Table Type
3½" Bar Cinn.-Gilbert Floor Type

DRILLS

1 spdl. 14" sw. #2 Avey, new 1945
1 spdl. 20" sw. #2LM8 L-G, 1945
1 spdl. 24" sw. #2MA6 Avey, new 1942
1 spdl. 26" sw. #4M8 L-G hydraulic
2 spdl. 24" sw. #3 Avey, AC MD
3 spdl. 20" sw. #2LM8 L-G, 1945
3 spdl. 24" sw. #3M8 L-G, new 1945
6 spdl. 20" sw. #1LM8 L-G, new 1945
#211-A Baker Univ. M.D., 1942
16 spdl. Fox #K60H, #2 taper, 1944

GRINDERS

3"x12" #5 B&S, 1942
4"x18" #5 B&S, 1941
4"x12" #4H Landis, New 1942
6"x18" Norton Type C, new 1943
10"x18" Norton Type C, new 1941
10"x36" Norton Type C, new 1942
10"x48" Norton Type C, new 1943
10" 12" sw. 1 & 48" Cinn. ER, 1943
10"x50" Hill-Clarke, AC Mot. Dr.
10"x72" Hill-Clarke, AC Mot. Dr.
16"x96" Hill-Clarke, AC Mot. Dr.
16"-30"x36" Norton, angular wheel
14"x72" Norton Type C, new 1941.
14"x96" Hill-Clarke, A.C. Mot. Dr.
16"-40"x96" Norton Gap, 1942
16"x72" Hill-Clarke, A.C. Mot. Dr.
16"-24"x72" Norton, AC MD 1941
18"x96" Hill-Clarke, AC Mot. Dr.
18"x120" Norton, AC MD.
24"x264" Norton, AC MD
30"-32"x144" Norton Pl. Cyl.
42"x72" Norton, extras, new 1947
#5A Bryant Internal, new 1943
#16A-16 Bryant Internal, new 1942
#16-26 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A3 Heald Int. Bisematic, 1944
#72A3 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#214 Besly Double End Disc, 1940
3B Abrasive Surf. 8"x24", 1942
#18-30" Blanchard Rot. Surf.

LATHES

16ML-16"x36" LeBlond Auto.
13"x30" Hendey Lathe, Taper Att.
12"x28" Lipe Carbo Semi-Auto
13"x33" Fay Automatic
13"x45" Fay Automatic
14"x36" Amer. Grd. Hd., MD
27"x144" Amer. Grd. Hd., MD
24"x42" Fay Auto. AC MD
36"x126" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x36", 1943
120"x96" or N-B-P, ser. 3389

#5W Cinn Acme Univ. Turret
#4 Gisholt Univ. Tur. A.C.&B.F.
#3H-10 Libby H.D. Tur. 1942
#4A W&S Turret Ser 3389963
4FU Fastermatic, tur. 32" sw. 1944
8D Potter & Johnston, new 1941

MILLERS

54"x30"x16' Ingersoll Slab, 1924
54"x60"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical Rotary
Davis & Thompson Vert. 1944
#13-B Pratt & Whitney Profilers
10"x60" P&W Mod. B. Thread Mill
#LT 8"x27" L. B Thread Mill
#CT L-B Thread Mill new 1942
No. 2 Cinn. Univ. Hi-Power
#118 Van Norman Prod. 1942

PLANERS

36"x36"x12' Rockford Openside '42
60"x48"x27' American, 4 hds.
60"x48"x36' Hamilton, 4 heads

MISCELLANEOUS

6" Goss & DeLeeuw 8 spdls. 1941
#306 Barnes Vert. Hone, new 1942
#11RD 2 Hd. W&S Tapper, latest
#36HM G&F 2 Spdl. Bevel Gear
612-A Fellows Gr Shaper 12" cam
#HBS Barber-Colman Sharp Mach
15 Ton Toledo Overhd. Crane, 29½

PHONE: CRawford 7-2000

HILL-CLARKE MACHINERY COMPANY 2106 S. KILBOURN AVE., CHICAGO 23, ILL.

McDONALD USED MACHINERY

New Britain Model 16 Auto. Chucker 6-Sp.
Bridgeport Vert. Miller with Shaping Attach
Brown & Sharpe No. 2 Surf. Grinder All Motorized
G&L 3" Bar Table Type Horiz. Boring Mill
Colburn 2-Spindle Box Col. Heavy Drill M.D. 20"
Niles (Timesaver Model) 32"x14' Bed Grd. Hd. M.D. Lathe 7' Centers.
Niagara 4' Power Shear ¼" Cap. 20" Gap
Ohio 24" M.D. All Grd. Feeds Shaper 1942 model
Cincinnati No. 5 Rest, Overarm Grd. Hd. Plain Horiz. Miller.
Baush 44" Vert. Boring Mill 2 heads.
American Vert. Hyd. Broach 48" str. 15 ton cap. 1947
American 20"x8' Grd. Hd. Lathe motor in base.
Landis 20"x72" and 18"x96" Plain xt. Grinder.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x40" Table
W&S No. 2-A Grd. Hd. Univ. Turret Lathe
Bliss 200 T Cap. S.S.S C.B. Grd. Press 8" Str. #77
Rivett No. 104 A.C. M.D. Internal Grinder, 1942.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers.
DoAll 16" Job Selector Metal Saw. 1950 Model.
Cincinnati 36"x36"x16' D. H. Planer 2 Hds. Box
Amer. 5' Radial Ensl. Hd. 16" Col. 32-Sp. Speeds.
Amer. 4 Radial 12" Col. Ensl. Hd.
Bliss #6N S.C. Gilles Type Press
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
B&S #2A Grd. Hd. Horiz. Univ. Miller.
Barnes 20" All Grd Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 26" chuck.
Sundstrand 4-Sp. Vert Rigidmill.
Heald #22 Rot. Surf Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed G.C.G. Lathe 1939.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 42" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kompsmith No. 2 Vertical Maximiller M.D.
P & J #2 Auto. Prod. Miller, 2 Tables.
Cincinnati #2, #3 & #4 Centerless Grinders, all Motor Driven.
Bullard 24" Vert. Turret Lathe.
Lynd-Farquhar 26" stroke opposite Shaper Planer.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

FOR SALE

#4 Cincinnati Centerless Grinder #3M4H1K (Fillmatic)
#15L Excello Thread Grinder #1383
#39A Excello Internal and External Thread Grinder #9188
Sundstrand Plain Duplex Milling Machine, Model #33FM18126, Ser. #56-365 (18 ft. table). Write

ALBERT TOOL & GAGE CO.
2301 Harrison Kansas City 8, Mo.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

TOOL & CUTTER GRINDERS

No. 1 Heald Tool Sharpener, m.d.
No. 2 LeBlond, full universal type
Grand Rapids Tap Grinder, style 12M
No. 2A Wm. Sellers Universal Tool Grinder, m.d.
No. 2B Sellers Wet Grinder, m.d.
No. 4T Sellers Tool, m.d., latest
No. 5T Sellers, m.d.
No. 13 Gleason Cutter Sharpener, m.d., late
Ingersoll Face Mill Grinder
No. 13 Brown & Sharpe Universal Cutter Grinder, m.d.
12" Gleason Spiral Bevel Gear Cutter Sharpener, m.d.
No. 4-4 Barber-Colman Hob Sharpener
Sundstrand Tool Grinder, m.d.

PRESSES

100 ton Wood Hydraulic Press, four col., single action
100 ton Chambersburg Hydraulic
No. 6 Verdin, Kappes & Verdin Straight Side Press
No. 4 Stevenson O.B.I. Punch Press, direct geared flywheel drive
Type 87/30 Hoeniflin Hydraulic Straightening Press
Model H Cleveland O.B.I. Punch Press, belt drive
No. 1 Losbough Jordon O.B.I. Punch Press, flywheel drive
No. 1 Robinson O.B.I., belt drive
No. 65B Niagara Straight Sided Single Geared Double Crank Press
No. 164½ Toledo Toggle Drawing & Deep Stamping Press

SAWS

Campbell Abrasive Cut-off, m.d.
No. 4XB Robertson Economy, m.d., new
No. 4B Robertson Economy, m.d., new
6x6" Peerless Hack Saw
No. 32B Cochran Bly Saw, m.d., latest
Model 401 Cutomatic Abrasive Cut-off, m.d.

ENGINE LATHES

Gema "Copyter" Duplicating Attachment, m.d.
12"x6' Lodge & Shipley, m.d.
12"x40" centers 6' bed American, m.d.
12"x84" centers Lodge & Shipley Geared Head, m.d., taper
13"x48" centers Pratt & Whitney Geared Head, m.d.
13"x42" centers LeBlond "Regal", m.d.
14"x32" centers Cincinnati Geared Head, m.d., late
14"x36" Lodge & Shipley, m.d.
14"x32½" centers American, m.d.
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' LeBlond, Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
16"x30" centers Monarch, m.d., taper
16"x54" centers Sidney, m.d.
16"x54" Boye & Emmes, m.d.
16"x50½" centers Monarch, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, m.d., taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
17"x6' LeBlond Geared Head, m.d.
18"x48" centers Lodge & Shipley Geared Head, m.d.
18"x6' American, 8 speed, m.d.
18"x6'6" Greaves-Klusman Geared Head, m.d.
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x84" Sidney, m.d.
18"x102" American, m.d.
18"x10'6" bed Boye & Emmes, cone, motorized
19"x8' bed LeBlond Geared Head, Timken, m.d.
19"x10' bed LeBlond Geared Head, m.d.
20"x48" centers Boye & Emmes, m.d.
20"x72" centers 10' bed Cincinnati Loose Change, cone
20"x72" centers Monarch Geared Head, m.d.
20"x70" centers American, m.d.
20"x8' bed Lodge & Shipley Geared Head, m.d.
20"x8' bed Greaves-Klusman Geared Head, m.d., in leg
20"x8' bed Boye & Emmes, m.d.
20"x10' Sidney Geared Head, m.d.
20"x10'6" Boye & Emmes, cone, motorized
21"x8' bed LeBlond Geared Head, m.d., taper
23"x84" centers LeBlond Heavy Duty Geared Head, m.d.
24"x12' bed American, m.d.
24"x12' bed LeBlond Geared Head, m.d., taper
24"x12' bed Boye & Emmes, belt drive
24" raised to swing 32"x22' bed—18' centers—New Haven, cone, taper
24" actual swing 25"x10' centers New Haven Loose Change, belt drive
24", 51¼" Lodge & Shipley Lathe, m.d.
25"x10' bed LeBlond Geared Head, m.d., taper
25"x10' centers LeBlond Heavy Duty G.H., m.d.
30"x12'6" bed Niles-Bement-Pond variable speed motor drive, taper
36"x132" Sidney, m.d., latest
42"x14' bed American Geared Head, m.d.
42" Putnam raised to swing 56½x20" bed Geared Head, m.d., 11'9" centers

MANUFACTURING LATHES

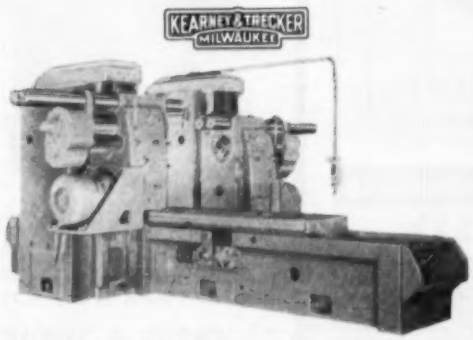
12x33", 20"x29", Jones & Lamson Fay Automatic Lathes, 1944
12x18" Reid Small Piece Production Lathe, Model 6WSL, m.d.
No. 3 Lodge & Shipley Duomatic, m.d., late type
No. 3A Lodge & Shipley Duomatic, m.d., late type
No. 4 LeBlond Boring Lathe, 37' bed, 4" hole, m.d., latest
No. 9, 12 LeBlond Multi-Cut, m.d.
No. 16 LeBlond Automatic, m.d.
4x60" LoSwing, m.d.
8x132" LoSwing, m.d., latest
11x16" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
Model U, 14"x24" centers, LoSwing, m.d.
No. 12 Gisholt Semi-Special Automatic Production, m.d.
No. 6WSL, Reid Production
17"x39½" LeBlond Mfg. Type Production
17"x75½", LeBlond, m.d.
No. 10 Sundstrand Automatic Production, m.d.
No. 12 Sundstrand Automatic Production, m.d.
No. 16 LeBlond Automatic, m.d.

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

Cadillac GUARANTEED EQUIPMENT

All Built 1950 to 1954



MODEL CSM BED TYPE DUPLEX
SERIES 4206 — BUILT 1953

SPECIFICATIONS:
Table 42" x 92"
Longitudinal feed 72"
2—30 H.P. spindle motors
Feed motor 7½ H.P.
Spindle speeds 50 to 750 RPM
Automatic table cycles
2-way cycle, climb milling
Weight about 65,000 lbs.

Norton Model CTU 10" x 18" Hydraulic Cylindrical Grinder, built 1950

Ex-Cell-O No. DB2112A Single End Boring Machine with 2 No. DB24 heads, built 1954.

Heald No. 261—12" Rotary Surface Grinder, built 1953.

National Acme No. RPA-6 10' 6-Spindle Chucker, equipped. Built 1954.

National Acme 12" "Chuckmatic" Single Spindle Chucker, with tailstock and accessories. Built 1953.

Colonial Model RD-6-42 Vertical Broach. NEW 6 Ton, 42" stroke, built 1953.

Sundstrand No. 4A Automatic Lathe, equipped. Built 1950.

Leland-Gifford No. 2LBM Step-By-Step Hydraulic Single Spindle (Woodpecker) Drill. Built 1950.

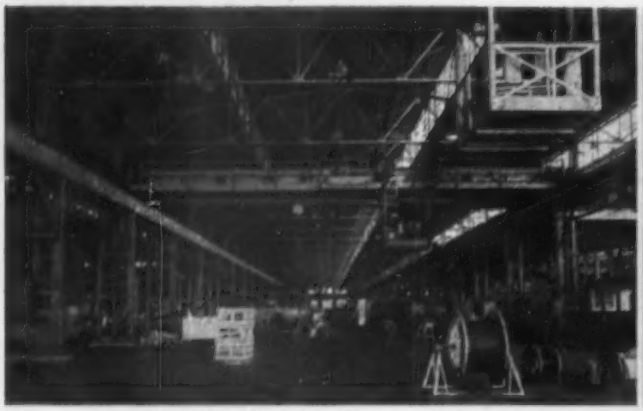
Niagara H 2½ Horn Press 22 Ton, adjustable table. Built 1951.

We also have 150 machine built 1940 to 1949.

For the LATEST and FINEST used machine tools write or phone

Cadillac Machinery Company
816 WEST LAKE STREET • CHICAGO 7, ILLINOIS

SEARCHLIGHT SECTION



FOR SALE...
129
OVERHEAD
CRANES
Immediately Available

3 TON TO 150 TON CAPACITY—37'2" TO 90 FT. SPAN

QUANTITY	DESCRIPTION	SPAN
1	150 ton	74'-3"
4	100 ton	74'-3"
3	70 ton	74'-3"
3	50 ton	74'-8"
8	40 ton	56'-0"; 66'; 76'
2	25 ton	62'-0"
3	20 ton	56'-0"
8	15 ton	62'; 71'; 76'-9"
4	12 ton	56'-0"
85	10 ton	37'-2"; 56'
2	7½ ton	56'-0"
5	5 ton	23'; 56'; 47'-3"; 90'
1	3 ton	31"

These cranes are cab operated, 230 volt D.C. operation. Several of these cranes have two trolleys and auxiliary hooks. D.C. generating equipment for the operation of these cranes is also available.

Detailed Engineering data is available upon request
Location: Eddystone, Pa. (Phila. Suburb)

LURIA BROTHERS & COMPANY, INC.
PHILADELPHIA NATIONAL BANK BUILDING
Philadelphia 7, Pa. Rittenhouse 6-7455

HB MACHINE TOOLS
NEW - USED REBUILT MACHINERY

Serving the World's Largest Manufacturers

#42 Heald Two Spindle Single End Barometric Serial #11137.

Late Type No. 2 Cincinnati Dial Type Universal High Speed Miller Serial 4A2U1P-35

48" x 48" x 12' Cleveland Heavy Duty Openside Planer

#300 Hanchett Vertical Surface Grinder Serial #300-17.

MONA MASSES

HAZARD BROWNELL MACHINE TOOLS INC.
350 WATERMAN STREET PROVIDENCE 6, R. I. DEXTER 1-8860

IMMEDIATE DELIVERY
BRAND NEW
CYRIL BATH

POWER PRESS BRAKES

#150-8	8'	x 5/16"	10' BED
#150-10	10'	x 1/4"	12' BED
#150-12	12'	x 3/16"	14' BED

PRESS & SHEAR MACHINERY CORP.
2600 EAST TIOGA STREET
PHILADELPHIA 34, PA.
GArfield 6-8840

CHOICE MACHINE TOOLS

CINN 5-60 Prod. Mill 1944
K&T 1484 Prod. Mill 1945
CINN 1-18 Prod. Mill 1951
SUNDSTRAND #1 Rigidmill 1954
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 80 KW, 10,000 cy. 1943
WARNER & SWASEY #3 Air Chuck & cyl.
GISHOLT #3, Air Chuck & Cyl. 1943

GISHOLT 1L, bar feed, C.S. turret, 1943
BULLARD 42", VTL Side Head
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl. Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 10x72 Plunge 1943
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #300 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads DC drive
SOMMER & ADAMS Thread Mill, 10", H.I.S. 1943
BIGNALL & KEELER 6" pipe threader, 1949
BIGNALL & KEELER 12" pipe threader, 1948
BLISS 312 W, SSSC, 600 Tn, 14" stroke, 43"x50" bed, 1947

NOLL EQUIPMENT CO.
4535 St. Clair Ave., Cleveland 3, O.
EXpress 1-0700

BENNETT MACHINERY CO.

BORING MILLS, 4½" & 4" Sellers Floor
6" Ingersoll—very large
4" Sellers Table, Late
3" Univ. Triway, Tble
10' Niles, 2 Hds., PRT
52" King, 2 Hds., PRT
36" & 24" Bullard New Eras
GRINDERS, 10"x96" Cinci. Cyl. Pl.
No. 36 Hanchett 36" Vert. Rotary
No. 16 Blanchard 30" Vert. Rotary
36"x42" Pratt & Whitney Die & Srf.
60" Hanchett Vert. Spin. No. 500
10"x20" B. & S. No. 1 Univ. '42
LATHES, 120" x 96" to 12" x 8'
TURRETS, Nos. 2H-10 & HS Libbys
Nos. 3AL, 2L & 3 Gisholts
Nos. 2 & 2G Mereys, 1" capty.
MILLERS, Nos. 5 HP Cinci. Pl. & Univ. (2)
No. 22LU Van Norman '44
No. 2 Cinci. Dial, Univ. '45

375 Allwood Rd., Clifton, New Jersey
Phone: PRescott 9-8996 N. Y. Phone: LOngacre 3-1222

ELECTRIC FURNACES TO 1850F
with Auto Temp Control. Sliding door, heavily insulated, substantial, accurate, dependable for machine shop, tool room, laboratory New
8"x12"x15" inside 4.5 K.W. $300.00
12"x16"x20" inside 9.0 K.W. $500.00
E. H. WILLIAMS
BOX 9042A, HUNTINGTON, W. VA.

---

10 to 12 foot lengths
Any diameter up to 1¼ inch
All thread forms
All metals

H&G threaded rods

For studs, hangers, worms, translating screws, etc.

Eastern Machine Screw Corp., New Haven, Conn. 20 Barclay St.

NOW! Get Late-Type Machine Tools at NEW LOW PRICES!

SATISFACTION GUARANTEED:

If any machine is not as represented, it may be returned within 30 days, *freight collect*, for full refund.

AUTOMATICS AND SCREW MACHINES

No. 00G Brown & Sharpe, Threader, 1948
1" Acme Gridley No. RA-6 Bar, 1943
2⅝" Acme Gridley, 6 Spindle Bar, 1942
2⅝" Conomatic, 8 Spindle Bar, 1942
5¼" Cleveland Model A, 1942
5¼" Cleveland Model B, 1948
475 New Britain, 1945

BORING MACHINES

No. 49 Heald Boramatic, Single End, 1943
2112A Excello Single End 1943

BROACHES

No. 6-24 LaPointe, Vert., Hyd., 1942
No. 5-54 LaPointe Vert. Hyd., Duplex, 1942
HP 100 LaPointe, 50 ton, 72", 1942
30 Ton, American Duplex Surface, 72" Stroke, Vert., 1943

DRILLS

No. 121 Baker, No. 4 M.T., 1942
No. 242 Barnes, 1942
3'-9" Cincinnati-Bickford, Late
4'-11" Cincinnati-Bickford Late

GEAR MACHINES

No. 6 Gleason Revacycle Generator, 3 Spindle, 1940
No. 7 Gleason Revex, Rougher, 1942
3" Gleason Straight Bevel Generator, 1943 (like new)
#12 Gleason Rougher, 1942
61, 645A3 Fellows Shaper, 1942
6Z2 Fellows Shaper 35" Pitch, 1942

GEAR HOBBERS

No. 130 Cleveland Rigidhobber, 1942
Model "S" Barber Colman Late

GRINDERS

10"x18" Norton Type "C" 1941
14"x48" Norton Type C, Heavy Duty, 1941
16"x48" Landis Type "D" Hyd. 1943
16"x48" Olivetti New (1953)
No. 72A3 Heald Sizematic, Internal, 1945
No. 74 Heald Extended Bridge Gap, Internal, 1941 (like new)
No. 22 Heald Rotary 12" Chuck 1941
No. 25A Heald Rotary 16" Chuck Rotary, 1942
No. TG 6x15 Jones & Lamson, Precision Thread. 1945
No. 35L Ex-Cell-O Precision Thread, 1943

GRINDERS, TOOL & CUTTER

#375 Gorton, 1942

RENT with option to purchase, or
BUY on our deferred payment plan.
Write for complete details

LATHES, ENGINE

32"x30' Samua, Heavy Duty, 2 Carriages, 1953
30"x540" Niles Timesaver, 1942
36"x20' Niles Timesaver, 1942

LATHES, TURRET

No. 3R Gisholt Universal Saddle, Chucker, 5" Cap., 1943
No. 4R Gisholt Universal Saddle, Chucker, 9" Cap., 1943
2A Warney & Swasey Preselector 1942
2H-8 Libby Univ. Saddle 1943
No. 4H-12 Libby Saddle Type 12" Cap., 1943
No. 5H-12 Libby Saddle Type, 12" Cap., 1943
No. 3A Warner & Swasey Univ. Saddle, Threading, 1943
No. 4A Warner & Swasey Universal Saddle Cross Slide, 1944

MILLERS

No. 2HL Milwaukee, 1942
No. 5 Sant Andrea, 1953
No. 2-24 Cincinnati Hydromatic, Rise & Fall, 1942
No. 3-24 Cincinnati, 1942

PRESSES, O.B.I.

#3 Federal 30 Ton, 1942
#5 Johnson O.B.I. Geared 1943
200 Ton HP Hydraulic 48"x48" Bed, Late
No. 255 6'-12 Ga D&K Press Brake 1941

SHEARS

6'-16 Ga Pexto Gap Shear 1944

INDIANAPOLIS MACHINERY & SUPPLY CO.

1953 SOUTH MERIDIAN STREET, INDIANAPOLIS 6, INDIANA • PHONE: STATE 4-4421

BRANCH SHOWROOMS: 229 Centre Street, New York 13, N.Y. • Dr. Valenzuela No. 11, Mexico, D.F., Mexico

---

MODERN MANUFACTURING FACILITIES AVAILABLE IN OUR MACHINED PARTS DEPT.

Monarch Air Tracer Lathe 20" & 14" (Shaft Work Up To 14 x 20 Contour Turning 28" Diameter)
Hendy & Monarch Engine Lathes
Internal & External Grinders
Duplicating, Pantograph, Drilling & Milling Equipment

J. G. TILP, INC.
SPRINGFIELD & MILLTOWN RD.
UNION, N. J.

LARGE LATHE

60" x 45' or 70' C.C.

Mackintosh-Hemphill, New 1943, 62' Bed, Heavy Duty, 2 M. D. Carriages, Geared Head, Screw-Cutting, 60" Face Plate, 3 Steady Rests, Additional 25' Bed Section Allowing 70' Centers, Wt. Approx. 160,000 lb.

Republic MACHINERY COMPANY
THOS. J. O'BRIEN, PRES.
WAlnut 2-5518

FOR SALE

MACHINE TOOL BUILDERS OFFER LINE OF RAM TYPE TURRET VERTICAL MILLING MACHINE.

Sale to consist of the entire business or any portion wanted as listed below:

Patterns, prints, jigs and fixtures, machine parts and assemblies, and rights to our milling machine line.

The line is well established throughout the United States by reputable dealers supplying us with a back log of orders.

BO-3285, AMERICAN MACHINIST
Classified Adv. Div., PO Box 12, NY 36, NY

REPLIES (Box No.) Address to office nearest you c/o this publication Classified Adv. Div.
NEW YORK: P.O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

BUSINESS OPPORTUNITY

Forged Hand Tool Factory in New York City for sale. Established 1911. Ideal Investment for competent blacksmith. BO-3486, American Machinist.

SPECIAL SERVICE

Time Study Boards, Stop-Watches, Slide Rules, pedometers, counters, etc. Observation sheets in stock. Write for Free Sample Kit. O. P. Co., 5544 So. Homan, Chicago 29, Ill.

DAVENPORT REBUILDING
MODERNIZING
A.A. INDUSTRIES, INC.
185 N. Water St., Dept. S, Rochester, N.Y.

Fellows No. 4B Burnisher.
Natco Nos. 5G & C12 Multi-Drills.
Gleason 3" Str. Bevel Gear Generators.
Fellows No. 4 Fine Pitch Shavers.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

FOR SALE

Keller Duplicator GG 1210
Bryant Hydraulic Internal Grinder 16C16
Bondycop Hydraulic Tracing Attachment Adaptable to any Lathe
Regent Fluid Motion Duplicator Table for Bridgeport Miller

J. G. TILP, INC.
Milltown Rd. Union, N. J.

New "SEARCHLIGHT" Advertisements

received by Dec. 18 will appear in the Dec. 31 issue, subject to space limitations.

Classified Advertising Division
AMERICAN MACHINIST, P.O. Box 12, New York 36, N. Y.

SEARCHLIGHT SECTION

GOOD MACHINE TOOLS FOR SALE

VERTICAL BORING MILL

24" Spiral Drive BULLARD Vertical Turret Lathe

DRILLS

No. 2 MA 6 AVEY, 15" overhang, large table
No. 3B Edlund, 12" overhang

GEAR CUTTERS & HOBBERS

No. 61 FELLOWS Gear Shaper (older)
No. 61A FELLOWS Gear Shaper (late)
No. 36BM GOULD & EBERHARDT 3-spindle Bevel Gear Cutter
No. 725 FELLOWS High Speed Gear Shaper
No. 12 GLEASON Straight Bevel Gear Rougher
No. 60SM GOULD & EBERHARDT 3-spindle Vertical Gear Cutter (nearly new)

GRINDERS

No. 5 BRYANT Internal Hydraulic Hole Grinder (late)
16-28 BRYANT Hydraulic Internal Hole Grinder (late)
No. 16-38 BRYANT Internal Hydraulic Hole Grinder (late)
No. 24P26 BRYANT Hydraulic Internal Hole Grinder (late)
No. 50 HEALD Internal Grinder (late)
6"x18" CINCINNATI Plain Cylindrical Grinder Type EA, saddle (rebuilt and ready)
10"x48" LANDIS Plain Cylindrical Type C Grinder (late)
14"x72" Plain CINCINNATI Self-contained Grinder
14"x168" LANDIS type CH Plain Cylindrical Grinder (late)
16"x36" NORTON Type C (plunge) Cylindrical Grinder (late)
Model 76 RAP ROGERS Knife Grinder

PLANER

36"x36"x26' CINCINNATI Double Housing Hypro Planer (reversing motor drive)

TURRET LATHES

No. 1A WARNER & SWASEY Geared Head Way Type (older)

MISCELLANEOUS

12" 8-Spindle BULLARD Mult-Au-Matic
6"x60" MODEL C PRATT & WHITNEY Thread Mill (rebuilt and ready)
No. 22 MURCHEY Single Head Threader (practically new)
18" DILL Universal Slotter (late)
Wicaco Oil Groover

THE MOTCH & MERRYWEATHER MACHINERY CO.

1250 East 222nd Street, Cleveland 17, Ohio • KEnmore 1-6300

DETROIT • PITTSBURGH • CINCINNATI • DAYTON

REPLIES (Box No.) Address to office nearest you
c/o this publication Classified Adv. Div.
NEW YORK: P.O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Machine Shop Assistant needed by medium sized heavy process machinery manufacturer. Young college engineer graduate with some experience preferred. Position has a future. First duties will cover rate setting, carbide tool development and assist in increasing productivity. Company has liberal profit sharing plan. Salary open. Location S.E. Penna. Reply P-8580, American Machinist.

Machine Shop Foreman well established producer and fabricator of welded steel tubing has opening for aggressive experienced machine shop foreman. Duties include design and production of all tools, rolls, bending dies, and gauges, and special equipment. Good salary and benefits. Write P-3215, American Machinist.

POSITION WANTED

Administrative Secy.—Office Mgr. superior skills, personable, 16 yrs. exp. aircraft parts mfg. PW-3463, American Machinist.

SELLING OPPORTUNITIES WANTED

Experienced New York Machine Tool Salesman with practical tool design & shop experience seeks lines. RA-3226, American Machinist.

Well-established Cleveland firm of sales engineers, operating throughout northern Ohio, presently representing nationally known machine tool manufacturers exclusively, open for one additional account. We offer considerable experience, versatility, and competence in sales engineering, with thorough knowledge and coverage of territory. Interested only in American quality line backed by good engineering and manufacturing facilities. Write RA-3439, American Machinist.

Anything within reason that is wanted in the field served by American Machinist, can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

"Key to Preventive Maintenance"

MACHINE TOOL RECONDITIONING

& the Art of Hand Scraping (new 2nd printing) —useful for design, shop & inspection work— Write for folder describing illustrated book.

MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabash Sts.
St. Paul 1, Minn.

COST REDUCTION PROGRAMS

- Organization
- Methods Improvement
- Job Evaluation
- Wage Incentives
- Budgetary Controls
- Diversification

WALLEY & ASSOCIATES
Management Consultants
Surveys — Installations — Training
25 Seminary Avenue Dayton 3, Ohio

EMPLOYMENT PROBLEM?

When you are in need of specialized men for specialized jobs, contact them through an employment ad in this publication.

FOR RATES OR INFORMATION

About Classified Advertising

Contact THE McGRAW-HILL OFFICE NEAREST YOU

ATLANTA, 3
1321 Rhodes-Haverty Bldg.—*Walnut 5778*
M. MILLER

BOSTON, 16
350 Park Square—*HUbbard 2-7160*
H. J. SWEGER

CHICAGO, 11
520 No. Michigan Ave.—*MOhawk 4-5800*
W. HIGGENS
J. BRENNAN

CINCINNATI, 37
1825 Yorktown Rd. Clifton Village, Apt. 2—*REdwood 1-3238*
G. MILLER

CLEVELAND, 15
1510 Hanna Bldg.—*Superior 1-7000*
W. SULLIVAN

DALLAS, 2
Adolphus Tower Bldg., Main & Akard Sts.—*PRospect 5064*
G. JONES

DETROIT, 26
856 Penobscot Bldg.—*WOodward 2-1793*
W. STONE

LOS ANGELES, 17
1125 W. 6 St.—*MAdison 6-9351*
H. KEELER
D. McMILLAN

NEW YORK, 36
330 West 42 St.—*LOngacre 4-3000*
S. HENRY, D. COSTER, R. LAWLESS
R. HATHAWAY

PHILADELPHIA, 3
17th & Sansom St.—*RIttenhouse 6-0670*
H. BOZARTH E. MINGLE

ST. LOUIS, 8
3615 Olive St.—*JEfferson 5-4867*
W. HIGGENS

SAN FRANCISCO, 4
68 Post St.—*DOuglas 2-4600*
R. ALCORN

Index of PRODUCTS ADVERTISED

In This Issue

Abrasives, Coated 76
Abrasives (Not Bonded) 73
Accessories & Attachments (Machine Tool) ..... 82, Insert Bet. 184-184C, 193, 209, 212, 217, 226, 236, 276, 299

Bearings 68, 219
Bending Machines 218
Boring, Drilling & Milling Machines (Horizontal) 14-15, 28-29, 36-37, 55, 74, 86, 216B
Boring Machines Internal ..... 2nd Cover, 45, 86
Boring and Turning Machines (Vertical) ..... Insert Facing 32, 69
Broaching Machines 26-27

Castings 260
Centering Machines 29
Centrifugal Machines 297
Chucks 280
Cleaning & Drying Machines & Supplies 247, 254
Compressors, Air 248B
Controls, Electrical 67, 203
Counters 32B
Cut-Off Machines 268, 282

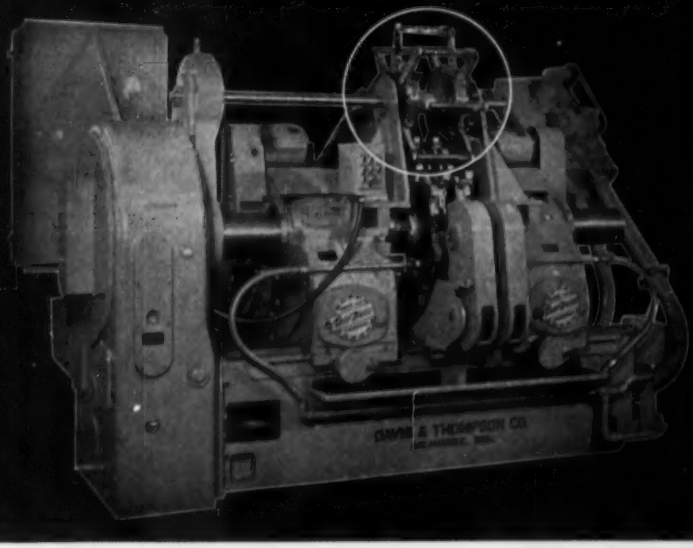
Die Sets 96
Drilling Machines 50, 65, 72, 74, 236, 241, 265, 268, 298
Duplicators & Pantographs 66, 77
Dust Collectors 206

Electrical Parts & Equipment 67, 203, 268
Electro Erosion (Electric Discharge & Ultrasonics) 269
Electro Plating & Painting Equipment & Supplies 297
Engineering & Production Services 256

Fabricating Methods & Services 256
Fasteners 30, 237, 254, 267, 272, 278

(Continued on page 292)

...Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.

Roto-Matic

Davis and Thompson Co.

WISCONSIN

MODEL D

SHORE SCLEROSCOPE HARDNESS TESTERS

Pioneer American Standard SINCE 1907

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

OVER 40,000 IN USE

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35B Van Wyck Exp.
Jamaica 35, N. Y.

MODEL C-2

External Grinder with two Internal Spindles which are interchangeable with External Spindle on machine.

for Precision Grinding— *External Internal Surface!*

These versatile Grinders can be mounted on lathes, planers, boring mills, milling machines and other machine tools for a large variety of grinding operations which crop up in every shop.

Rigid construction throughout with large precision type bearings insure accuracy for production and tool room work. Constant speed motors provide the uniform wheel speed so vital for best grinding results.

Dovetail slide on spindles facilitates changing from one spindle to another with perfect alignment.

Large flat pad with several bolt slots adapts the Grinder to the regular tool holding fixture of the machine on which it is to be mounted.

Large selection of Internal Spindles available for various lengths and diameters.

Made in sizes from ¼ HP to 10 HP capacity

Other "HISEY" Products: Bench and Pedestal Grinders and Buffers; Snagging Grinders; Wet Tool Grinders; Disc Grinders; Drill Grinders and Dust Collectors.

ASK FOR CATALOG 72 XH

Hisey THE HISEY-WOLF MACHINE CO.
354 MT. HOPE AVE. • CINCINNATI 4, OHIO

From the *American Machinist* Library of *Tips for Top Shop Men*

YOUR manufacturing engineers should have just one job: to make your present methods obsolete. The more they succeed, the greater is your productivity.

Index of

PRODUCTS ADVERTISED

In This Issue

•

(*Continued from page* 291)

Gages, Instruments & Testing Equipment 44, 91, 94-95, 187, 202, 208, 221, 223, 230, 232, 246, 248, 253, 262, 264B, 268, 272, 275, 276, 278, 291, 297

Gear Cutting Machines 3, 6-7, 22-23, 256, 281

Gears, Speed Reducers, Motor Reducers 262

Gear Testers 3, 6-7

Grinders—Cutter & Tool 197, 227, 258, 278

Grinding Machines—Production 8-9, 12-13, 16-17, 18-19, 21, 64, 65, 197, 220, 255, 264, 266, 282, 292

Grinding Wheels 31, 75, 261

Heads Drilling, Grinding & Tapping 10-11, 46, 254, 256

Heat Treating Equipment & Supplies 200, 207, 258

Honing Machines 214-215, 233

Hydraulic & Pneumatic Parts & Equipment 109, 189

Industrial Financing Plan 293

Jig Borers 191, 199, 213, 241, 280, 295

Jigs & Fixtures 256

Keyseaters 272, 276

Lapping Machines 62

Lathes, Automatic 33, 48-49, 56-57

Lathes, Engines 34, 52-53, 66, 77, 78, 80-81, 84-85, 209, 249, 298

Lathes, Turret 41, 42, 58-59, 70, 271

Lubricants, Cutting Fluids, Quenching Oils & Solvents ..... 43, 47, 60, 63, Insert Bet. 64-65, 71, 106, 225, Insert Facing 264, 282

Lubricating Systems & Equipment 262

Marking Machines, Tools, & Supplies 92, 270

Materials, Cutting & Forming ..... 4th Cover, 94-95, Insert Bet. 184-184C, 260, 300

Materials of Manufacture 20, 24-25, 32, 35, 51, 54, 110, 166, 168, 195, 219, 228, 243, 244, 258, 259, 274, 277

Index of PRODUCTS ADVERTISED

In This Issue

Materials Handling Equipment 40
Millers, Die Sinkers, Profilers 4-5, 291, 295
Motors, Electrical 102, 164, 185

Planers 28-29
Power Transmission 263, 270
Presses, Forging & Forming Equipment & Supplies 162, 206, 210-211, 218, 235, 257, 273, 276, 279, 282, 293, 296
Production, Inventory & Tool Control 239

Rust Preventives 242

Saw Blades 88, 94-95, 216
Sawing Machines 88, 256
Screwdriving & Nutrunning Machines 65
Screw Machines; Chucking Machines 8-9, 45, 89, 204-205
Shapers & Slotters 112
Special Machine Tools 38-39, 46, 48-49, 83, 98, 104-105, 216B, 224, 235, 245, 258, 294
Spindles, Machine 229, 256, 295
Stampings 240

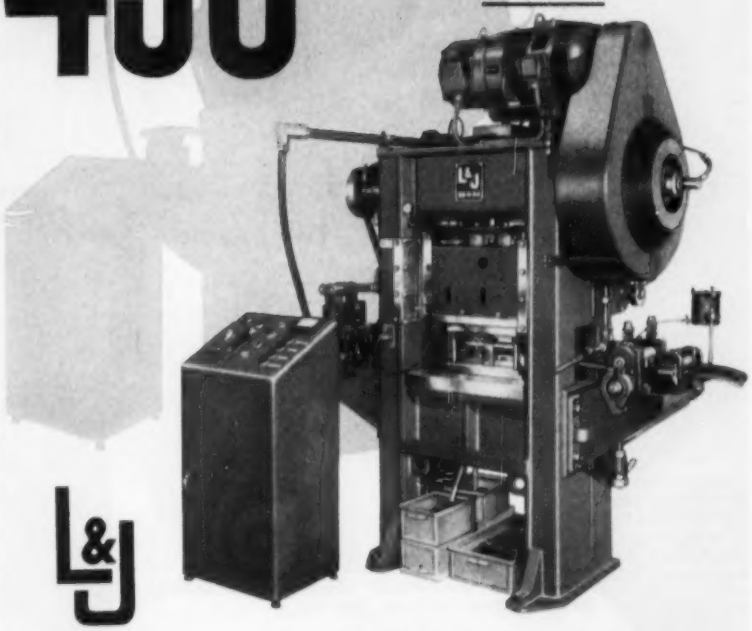
Tapping Attachments 280
Tapping Machines 299
Thread Cutting Machines 266
Thread Rolling Machines & Tools 10-11, 93
Tooling Set-up Equipment 241, 272
Tools, Cutting ..... 3rd Cover, 22-23, 79, 87, 90, 100, 109, 161, Insert Bet. 184-184C, 193, 201, Insert Fac. 216, 217, 222, 234, 238, Insert Facing 248, 272, 274
Tools, Hand 212
Tools, Measuring 94-95
Tools, Portable 65
Turret Attachments, Lathe 271

Used & Surplus Equipment 284-290

Vises 226, 272, 280

Welding & Cutting Equipment & Supplies 61, 231, 252, 270

450 S.P.M. to keep production costs down



L&J

DOUBLE CRANK STRAIGHT SIDE PRESS

Here's new life for lagging production — speeds up to 450 strokes per minute to give you new highs in the output of small precision parts. Designed primarily for use with progressive dies this versatile press gives you everything you need — speed — accuracy — big capacity — long die life — ease of set-up. It pays off in lower production costs. Write for complete information.

L & J Press Corporation • 1629 Sterling Ave. • Elkhart, Indiana

SPECIFICATIONS

Model	20-2-24	30-2-24	40-2-36	50-2-36
Capacity	20 tons	30 tons	40 tons	50 tons
Speed, strokes per min.	150-450	150-450	150-300	150-300
Die space, standard	11"	11"	12"	12"
Ram area	24" x 12"	24" x 12"	36" x 20"	36" x 20"
Bolster plate	24" x 19"	24" x 19"	36" x 24"	36" x 24"
Stroke lengths, standard	1"—2"	1"—2"	1"—3"	1"—3"
Ram adjustment (ratchet)	2"	2"	2"	2"

MACHINE TOOL LEASING

by J. L. TREYNOR, MBA and R. F. VANCIL, MBA, CPA

A NEW 142 PAGE REPORT GIVING

AN ANALYSIS of the real and claimed advantages of leasing, with specific reference to 16 common leasing plans, including income tax implications.

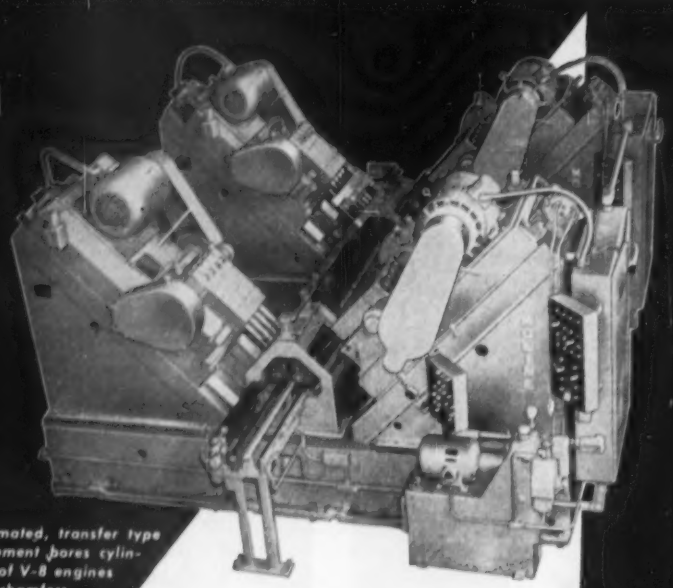
A TECHNIQUE for making valid cost comparisons, including completely worked out tables that show quickly whether buying is cheaper than leasing in a given situation.

The N. Y. Times has called this report "a special value." If you don't agree return it within fifteen days and pay nothing. Price $15 postpaid.

MANAGEMENT ANALYSIS CENTER, INC.
275 G Newbury St., Boston 16, Mass.

For Greater...

PRODUCTION • EFFICIENCY • SAVINGS



Automated, transfer type equipment bores cylinders of V-8 engines and chamfers both ends of bores.

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- **Multi-Spindle Boring**
- **Single and Multi-Spindle Honing**
- **Straight Line Multi-Drilling**
- **Adjustable Spindle Drilling**
- **Vertical and Way-Type Fixed Center Drilling, Boring and Tapping**
- **Special Multiple Operation Machine Tools**

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

Representatives in principal cities.

181

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS

***Less than a dime a week . . .* BRINGS**
AMERICAN MACHINIST
Right to your home—FOR KEEPS!

27 big, timely, informative issues a year for only $5. (Canada $7)

Write to: Circulation Dept., American Machinist,
330 W. 42nd St., New York 36, N. Y.

Send no money now—we'll bill later.
State name, address, title, company, product mf'r'd. and approx. number of employees.

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Aaron Machinery Co. Inc.	298
Acromark Company	270
Allegheny Ludlum Steel Corp.	300
Allis-Chalmers Manufacturing Company	164
Alvord-Polk Tool Company	272
American Brass Company	51
American Chain & Cable Co., Inc.	40, 208
American Machinist	250-251
American Screw Company	267
American Sip Corporation	199
American Steel & Wire Division	32
American Tool Works Co.	77
Ames Company, B. C.	230
Armco Steel Corporation	110
Armstrong Blum Mfg. Company	88
Armstrong Brothers Tool Company	82
Atlantic Screw Works, Inc.	267
Axelson Mfg. Company, Div. of U.S. Ind. Inc.	80-81
Baker Bros. Inc.	224
Barber-Colman Company	22-23
Barnes Co., Inc., W. O.	216
Barnes Co., W. F. & John	83
Barrett Co., Leon J.	297
Bath Company, Cyril	279
Baush Machine Tool Co.	245
Bay State Abrasive Products Co.	261
Bay State Tap & Die Company	100
Beatty Machine & Mfg. Co.	282
Behr-Manning Corp.	76
Besly-Welles Corp.	246
Bijur Lubricating Corporation	262
Blake Co., Edward	278
Blake & Johnson Co.	267
Blanchard Machine Co.	64
Brown & Sharpe Mfg. Co.	33, 234
Brush Electronics Company	275
Bryant Chucking Grinder Company	45
Bryant Machinery & Engineering Co.	265
Buhr Machine Tool Co.	104-105
Bullard Co.	Insert Facing 32
Bunting Brass & Bronze Co.	219
Butterfield Div. of Union Twist Drill Co.	87
Can-Pro Corporation	299
Carborundum Company	258, 274, 299
Carlton Machine Tool Company	50
Carolina Power & Light Company	278
Carpenter Steel Company	277
Central Screw Company	267
Century Electric Company	185
Chandler Tool Company	254
Chicago Tool & Engineering Co.	272
Cincinnati-Bickford Tool Co. Sub-Giddings & Lewis Machine Tool Co.	72

INDEX TO ADVERTISERS

	Page
Cincinnati Gilbert Machine Tool Co.	55
Cincinnati Grinders Incorporated	16-17
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co., Grinding Wheels Division	75
Cincinnati Milling Products Div., Cincinnati Milling Machine Co.	71
Cincinnati Shaper Co.	112
Cities Service Oil Co.	63
Cleereman Machine Tool Company	265
Cleveland Punch & Shear Works Company	273
Cleveland Twist Drill Co. Insert Facing	248
Climax Molybdenum Co. of New York	195
Columbia-Geneva Steel Div.	24-25, 32
Columbus Die-Tool & Machine Co.	256
Comtor Co.	276
Cone Automatic Machine Co.	89
Consolidated Machine Tool Div., Farrel-Birmingham Co., Inc.	69
Continental Screw Company	267
Copperweld Steel Company	166
Cosa Corporation	266
Covel Manufacturing Company	264
Crane Packing Co.	62
Crucible Steel Co. of America	20
Curtis Pneumatic Machinery Div., Curtis Mfg. Co.	248B
Custom Scientific Instruments Inc.	278
Danly Machine Specialties Inc.	96
Davis Keyseater Company	272
Davis & Thompson Company	291
Denison Engineering Company	257
DeVlieg Machine Company	213
Diamonite Products Div., U.S. Ceramic Tile Company	238
DoAll Company	202
Dodge Manufacturing Corporation	270
Dow Chemical Co.	259
Dow Corning Corporation	282
Doyle Design & Machine Company	268
Dreis & Krump Manufacturing Co.	218
Eastern Machine Screw Corporation	256
Eastman Kodak Co., Special Products Division	187
Elco Tool & Screw Corporation	267
Ellstrom Standards Div., Dearborn Gage Company	248
Engelberg Huller Company Inc.	220
Ex-Cell-O Corporation	98
Fawick Airflex Division, Fawick Corporation	263
Federal Machine & Welder Company	252
Fellows Gear Shaper Company	6-7
Field Company, Inc., William H.	227
Fosdick Machine Tool Company	241
Gardner Machine Company	21
General Electric Apparatus Dept.	61, 67
General Radio Company	223
Giddings & Lewis Machine Tool Company	14-15
Gisholt Machine Company	58-59
Gleason Works	3
Goddard & Goddard Co.	222
Goss & DeLeeuw Machine Company	204-205

(*Continued on page 296*)

X Multiply the use of your surface grinder...

+ Add a *Whitnon*

HIGH SPEED ATTACHMENT

Most 6x18 surface grinders can now be used to finish small radii on dies or parts requiring small contour grinding by merely adding a Whitnon high speed surface grinder attachment. This assembly, in effect, creates an extra machine at little cost and increases the production range of your present grinder.

Whitnon surface grinder attachment comes as a complete kit, and can be shipped in a fitted wooden case. The offset pulley No. 5 makes it possible to reach into deeper holes and recesses than the flat pulley. Tapered arbors up to 4" in length available for direct wheel mounting if required.

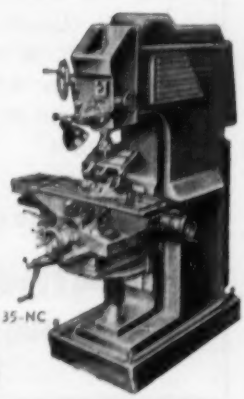
1. Bracket 2. Eccentric bushing 3. 20,000 RPM grease lubricated spindle 4. Flat pulley 5. Offset pulley 6. Belt 7. Wheel & pulley mount 8. Collet type arbor 9. Arbor wrenches 10. Wheel & wheel mount wrench

THE *Whitnon* MANUFACTURING COMPANY
ROUTE 6 AND NEW BRITAIN AVE., FARMINGTON, CONNECTICUT

NEW MODEL

TRIPLEX JIG BORER and VERTICAL MILLER

Optical positioning in 21" x 12" area.
2½ HP motor • Amer. Standard spindle nose.
100-2000 RPM infinitely variable spindle speed.



ACCURATE • VERSATILE • DEPENDABLE

for full details write to

TRIPLEX MACHINE TOOL CORP.
75 West St., New York 6, N.Y. HAnover 2-4520

This 25-TON Hannifin Straightening Press Sells For $4,455 FULLY EQUIPPED AS SHOWN

Price F.O.B. our press plant at St. Marys, Ohio, subject to change without notice

The ideal press for straightening heat-treated parts up to 60" between centers. Exclusive Hannifin Sensitive Pressure Control for speed and accuracy. Ram block, two table blocks and center-type fixture complete with rails included.

STRAIGHTENING PRESSES FROM 5 TO 150 TONS

Hannifin offers longer tables and rails, roller-type fixtures, larger or smaller capacities (5 to 150 tons)—all at prices that are easily justified by savings on the job. Bring us your straightening problems.

HANNIFIN

HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

PRECISION PRODUCTION at GRAFLEX

At Graflex, Inc., in Rochester, N.Y., operators inspect their own work and get paid for it, and foremen have full freedom of action. These are just two important characteristics of the organization of the camera and precision-equipment manufacturer bearing this familiar name.

This *American Machinist* Special Report by Executive Editor E. J. Tangerman describes production methods at Graflex in detail. Over fifty photographs and other illustrations add to the value of the twenty-page report.

20 pages — — — 25 cents per copy

Reader Service Department

American Machinist

McGraw-Hill Building New York 36, N. Y.

INDEX TO ADVERTISERS

(Continued from page 295)

	Page
Grant Gear Works Inc.	262
Gray Co., G. A.	28-29
Great Lakes Screw Corporation	267
Greenfield Tap & Die Corp.	Insert facing 216
Greer Stop Nut Co.	278
Gulf Oil Corporation	225
Hamilton Tool Company	299
Hannifin Corp.	296
Hardinge Brothers, Inc.	78
Harper Company, H. M.	267
Hartford Special Machinery Co.	38-39
Haynes Stellite Co., Div. Union Carbide & Carbon Co.	260
Heald Machine Co., Sub Cincinnati Milling Machine Co.	2nd Cover
Henry & Wright Div., Emhart Mfg. Co.	210-211
Hisey-Wolf Machine Company	292
Hoern & Dilts Div. of the New Britain Machine Co.	86
Hones, Inc., Charles A.	258
Houghton & Co., E. F.	47
Ingersoll Milling Machine Co.	161
J & S Tool Co. Inc.	226
Jahn Manufacturing Co., B.	235
Johnson & Son, Inc., S. C.	Insert facing 264
Jones & Lamson Machine Company	70
Jones & Laughlin Steel Corp.	35
Kaukauna Div. Giddings Lewis Machine Tool Co.	74
Kenco Mfg. Co.	276
L. & J. Press Corp.	293
Laminated Shim Co., Inc., Shim Div.	240
Lamson & Sessions Company	267
Landis Machine Company	10-11
Landis Tool Company	12-13
LaPointe Machine Tool Company	26-27
Lavalle & Ide Inc.	90
LeBlond Machine Tool Co., R. K.	84-85
Levin & Sons Inc., Louis	268
Linde Air Products Div. Union Carbide Corp.	231
Linley Brothers Co.	280
Lodge & Shipley Company	66
Lucas Machine Division, New Britain Machine Company	36-37
Management Analysis Center, Inc.	293
Maschinenfabrik Lorenz A. G.	281
Master Electric Company	102
Matra-Werke GmbH	282
M. B. I. Export & Import Ltd.	280
McCaskey Industrial Div., Victor Adding Machine Company	239
Metal Treating Institute	200
Michigan Drill Head Co.	46
Micromatic Hone Corp.	214-215
Mitts & Merrill	276
Modern Machine Tool Company	268
Moline Tool Company	294
Monarch Machine Tool Company	209
Mueller Brass Company	54
National Lock Company	267

INDEX TO ADVERTISERS

	Page
National Screw & Manufacturing Co.	267
Nelco Tool, Inc.	234
New Britain Machine Company, The	36-37, 86
Nikon Incorporated	272
Noble & Westbrook Mfg. Co.	92
Norton Company	18-19, 31, 73
O.K. Tool Co., Inc.	3rd Cover
Oakite Products Inc.	247
Oliver Instrument Company	258
Olofsson Corporation	221
O'Neil-Irwin Mfg. Co.	206
Orban Co., Inc., Kurt	191
Ottemiller Co., Wm. H.	272
Parker-Kalon Division, General American Transportation Corp.	267
Parker Majestic Inc.	229
Pheoll Manufacturing Company	267
Pope Machinery Corp.	256
Portage Machine Co.	216B
Pratt & Whitney Co., Inc.	201, 232
Randall Co., Inc., Frank E.	297
Raytheon Mfg. Co., Equipment Marketing	269
Reed Prentice Corporation	34
Reed Rolled Thread Die Company	93
Reid Brothers Co., Inc.	197
Ross Operating Valve Company	189
Rotor Tool Co.	65
Russell Burdsall & Ward Bolt & Nut Co.	237
Ryerson, Joseph T. & Sons Inc.	168
S. K. F. Industries Inc.	68
Scherr Co., Inc., George	256
Scovill Manufacturing Company	267
Screw Research Association	267
Sealol Corporation	236
Seneca Falls Machine Company	56-57
Shakeproof Div., Illinois Tool Works	267
Sheffield Corp.	91
Sheldon Machine Company	249
Shore Instrument & Mfg. Co., Inc.	291
Socony Mobil Oil Co., Inc. & Affiliates	60
Sonnet Tool & Mfg. Company	274
South Bend Lathe Works	271
Southington Hdwe. Mfg. Company	267
Springfield Machine Tool Co.	52-53
Standard Horse Nail Corp.	254
Standard Oil Co. (Indiana)	43
Standard Pressed Steel Co.	30
Starrett Co., L. S., The	94-95
Sterling Bolt Company	267
Sundstrand Machine Tool Company	48-49
Sunnen Products Company	233
Sun Oil Company	Insert Bet. 64-65
Surface Combustion Corp.	207
Taft-Peirce Mfg. Co.	44
Tannewitz Works, Inc.	256
Tennessee Coal & Iron Div.	24-25, 32
Texas Co.	106
Timken Roller Bearing Company & Steel Tube Div.	4th Cover
Tomkins-Johnson Company	109
Torit Manufacturing Company	206

(*Continued on page* 298)

REDUCE EXPENSE

IN COATING
IRREGULARLY-SHAPED
PARTS
WITH THE

BARRETT

CENTRIFUGAL

ENAMELER

QUICK
BULK
PROCESSING

ENAMELING

Uniform coverage with less paint. Only 1/3 to 1/2 as much paint as required for spraying—no drips or fatty edges.

LACQUERING

Plated and polished stampings and machined parts with clear or colored lacquers.

RUSTPROOFING

Complete protection of even the most inaccessible surfaces—no thin spots.

THE LEON J. BARRETT CO.

1800 GRAFTON ROAD, WORCESTER, MASS.

RANDALL and STICKNEY
Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

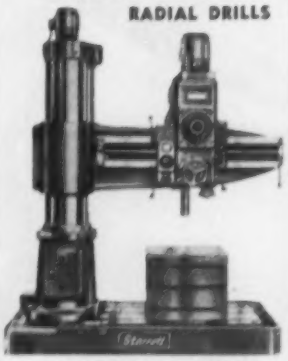
Model "C 50 B" has a 2½" overall diameter, balanced dial 0-25-0 with .0005" graduations, ½" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is an R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
243 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gages Since 1896

BEST VALUES in U.S.A.
STARRETT
RADIAL DRILLS

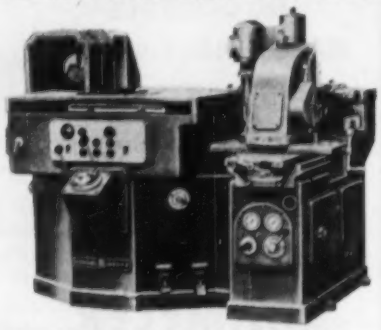


Sizes 2½' to 6' $1769. to $6595.

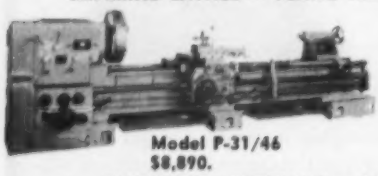
OUTSTANDING NEW MACHINERY
AT LOWER COST!

$1. BUYS ANY MACHINE Upon Termination of 3 Year Rental Plan.

HOMMEL—OPSM—Optical Profile Grinder



IMPERIAL LATHES — FLAME HARDENED AND GROUND BED WAYS



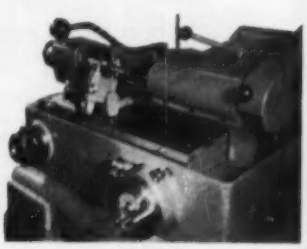
Model P-31/46
$8,890.

Model PS-34/61
$11,990.

Swing from 12" to 67" available

OVERBECK — EXTERNAL and INTERNAL PRECISION GRINDERS

$2995.00



$3195.00

AARON MACHINERY CO., INC.
DEPT. A • 45 CROSBY ST., N.Y. 12 • WA 5-8300
Branches at: Buffalo, N.Y. Mineola, N.Y. Los Angeles, Calif.

Liberal Terms

From the *American Machinist* Library of *Tips for Top Shop Men*

TAKE a man's pride in his job away, and there isn't much left; he becomes another automaton. Even a trained seal enjoys the applause as much as he does the fish.

INDEX TO ADVERTISERS

(Continued from page 297)

	Page
Transicoil Corporation	203
Triplex Machine Tool Corp.	295
Union Carbide & Carbon Corp.	231, 260
Union Twist Drill Company	79
United States Steel Corp. (Alloys)	24-25, 32
U. S. Steeel Company (MX Bars.)	24-25
U. S. Steel Export Co.	24-25, 32
U. S. Steel Supply Div.	24-25, 32
Universal Screw Co.	267
V & O Press Company Div., Emhart Mfg. Co.	210-211
Valenite Metals Corporation	
Valentine Metals Corporation	Insert Bet. 184-184C
Valvoline Oil Company, Division Ashland Oil & Refining Co.	242
Van Keuren Company	253, 262
Van Norman Machine Co.	8-9
Vapor Heating Corporation	254
Vascaloy-Ramet Corporation	193
Veeder-Root Inc.	32B
Verson Allsteel Press Co.	162
Waldes Koh-I-Noor Inc.	217
Waldrich, H. A., GMBH	255
Wales-Beech Corporation	267
Warner & Swasey Company	41, 42
Webber Gage Company	264B
Westinghouse Electric Corp.	270
Wheelock Lovejoy & Co., Inc.	228
Whitnon Mfg. Co.	295
Williams & Co., J. H.	212
Wilson Mechanical Instrument Div., American Chain & Cable Co.	208
Wolverine Tool Co.	276
Wyckoff Steel Company	244
Youngstown Sheet & Tube Company	243

AMERICAN MACHINIST
ADVERTISING SALES STAFF

Atlanta 3 . . . M. H. Miller, 801 Rhodes-Haverty Bldg., Walnut 5778
Boston 16 . . . J. H. Koch, 350 Park Square Bldg., Hubbard 2-7160
Chicago 11 . . . W. J. Haring, Bayard Nicholas, 520 N. Michigan Ave., Mohawk 4-5800
Cincinnati 8 . . . R. H. Anderson, 1110 Delta Ave., East 1-6110
Cleveland 15 . . . Gifford W. Plume, Jr., R. H. Anderson, 1510 Hanna Bldg., Superior 1-7000
Dallas 2 . . . G. L. Jones, Jr., Adolphus Tower Bldg., Prospect 5064
Detroit 26 . . . W. J. Reichard, 856 Penobscot Bldg., Woodward 2-1793
Los Angeles 17 . . . H. L. Keeler, 1125 West Sixth St., Madison 6-9351
New York 36 . . . G. H. Krimsier, J. F. Jurascheck, 330 W. 42nd St., Longacre 4-3000
Philadelphia 3 . . . J. P. Tiebout, Architects' Bldg., 17th & Sansom Sts., Rittenhouse 6-0670
Pittsburgh 22 . . . K. Reeves Cook, 919 Oliver Bldg., Atlantic 1-4707
St. Louis 8 . . . Bayard Nicholas, 3615 Olive St., Continental Bldg., Jefferson 5-4867
San Francisco 4 . . . R. C. Alcorn, 68 Post St., Douglas 2-4600
England . . . Herbert Lagler, McGraw-Hill House, 95 Farringdon St., London, E. C. 4

INDEX TO ADVERTISERS

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 290

EDUCATIONAL
Periodicals 290

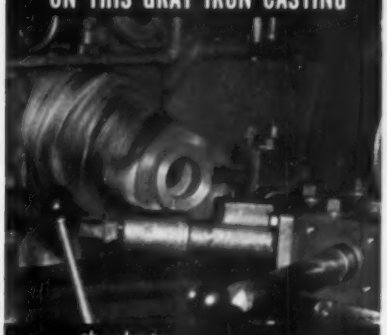
BUSINESS OPPORTUNITIES
Offered 289

EQUIPMENT
(Used or Surplus New)
For Sale 284-290

ADVERTISERS INDEX

Albert Tool & Gage Co. 286
Bennett Machinery Co. 288
Brownell Machine Tools Inc., Hazard... 288
Cadillac Machinery Co. Inc. 287
Dony Machinery, D. E. 289
Eastern Machinery Co., The 287
Eastern Machine Screw Corp. 288
Falk Mill Supply Co. Inc. 286
Hill-Clarke Machinery Co. 286
Hyman, Joseph 285
Indianapolis Machinery & Supply Co. 289
Luria Brothers 288
Machine Tool Publications 290
McDonald Machinery Co. 286
Miles Machinery 285
Morey Machinery 285
Motch & Merryweather Machinery Co.. 290
National Machinery Exchange 285
Noll Equipment Co. 288
Press & Shear Machinery Corp. 288
Republic Machinery 289
Tilp Inc., J. G. 289
United Machinery & Tool Corp. 285
Walley & Associates 290
Williams, E. H. 288

UNIT MACHINING COST CUT 17% ON THIS GRAY IRON CASTING



...thanks to

FERROCARBO®

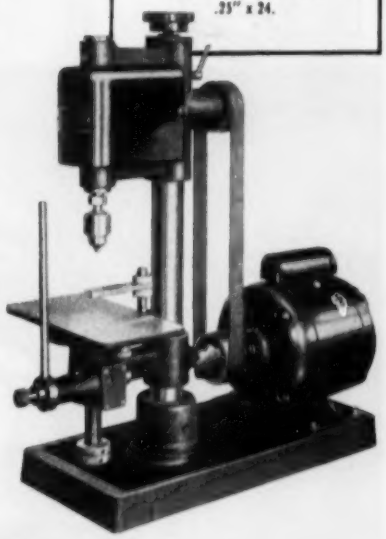
Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 12, Niagara Falls, N.Y. 64-52

CARBORUNDUM®

Now *Precision* TAPPING OF THIN AND BRITTLE MATERIALS

Hamilton Super Sensitive, Small-Hole, Precision Tapping Machine.
Capacity — .034" x 120 to .25" x 24.



Recent design change provides a simple homing device as a standard component of the

HAMILTON
SUPER SENSITIVE, SMALL-HOLE
PRECISION
TAPPING MACHINE

and makes routine of such problem work as the tapping of precision holes in thin metal sheets or in brittle plastics. Even improves performance in the tapping of blind holes!

YOU

will want full information about this important development!

WE WILL FURNISH IT

FREE

ask for
BULLETIN No. 2463

ADDRESS

THE HAMILTON TOOL COMPANY
830 South Ninth Street
HAMILTON, OHIO

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

2463

REPRESENTED IN CANADA BY
Sykes Tool Corporation, Ltd., 123/131 York Street, Toronto
Sykes Tool Corporation, Ltd., 515 Bisson Street, Montreal

WAY GUARDS

- KEEP WAYS CLEAN
- SAVE THE MACHINE
- SAVE THE MAN

Made by experienced men to fit your needs.

MADE OF OIL RESISTANT COATED FABRIC
HIGH ABRASION TEST

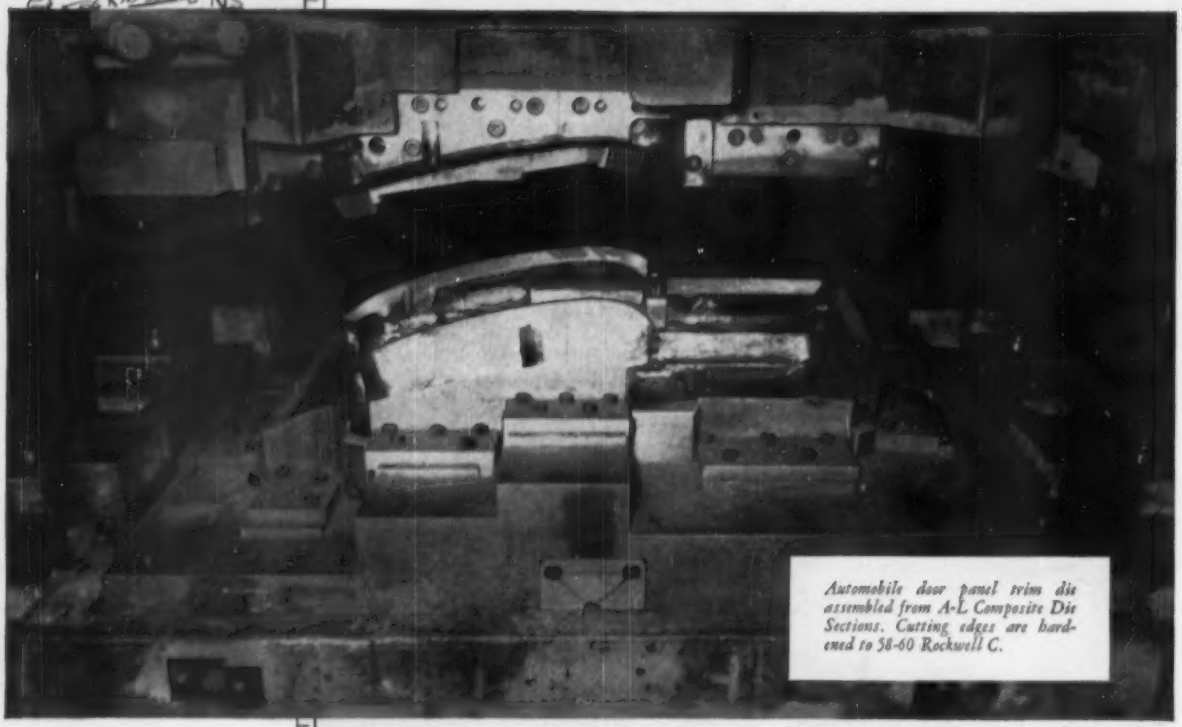
WRITE FOR DETAILS

CAN-PRO Corporation
36 MCWILLIAMS STREET
FOND DU LAC, WISCONSIN

Why pay the price for CUSTOM-MADE DIES...

when you can easily assemble the shapes you need

from A-L COMPOSITE DIE SECTIONS



Automobile door panel trim die assembled from A-L Composite Die Sections. Cutting edges are hardened to 58-60 Rockwell C.

SEND FOR THIS NEW CATALOG "FORGING AND CASTING PRODUCTS"

Contains the latest information on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties that can save you time and money . . . also Composite Die Sections and Smooth Hammered Forgings in a wide range of tool and stainless steels. *Don't wait—get your copy NOW.*

Write Today

ADDRESS DEPT. AM-84

Dies can be assembled from A-L Composite Die Sections to blank, trim, bead or do any job requiring the cutting of sheet metal to regular or irregular shapes. Thousands of die shapes are possible from combinations of the thirty-five standard sections carried in stock. Thus, you save the time and trouble of machining custom-made sections from solid stock and minimize the waste of valuable tool steel.

These standard sections . . . made in a variety of water hardening tool steel grades . . . are electrically butt welded by a special process to non-hardenable mild steel bases. Because the base always remains soft, screw and dowel holes are easily drilled after the tool steel edges have been machined and heat treated.

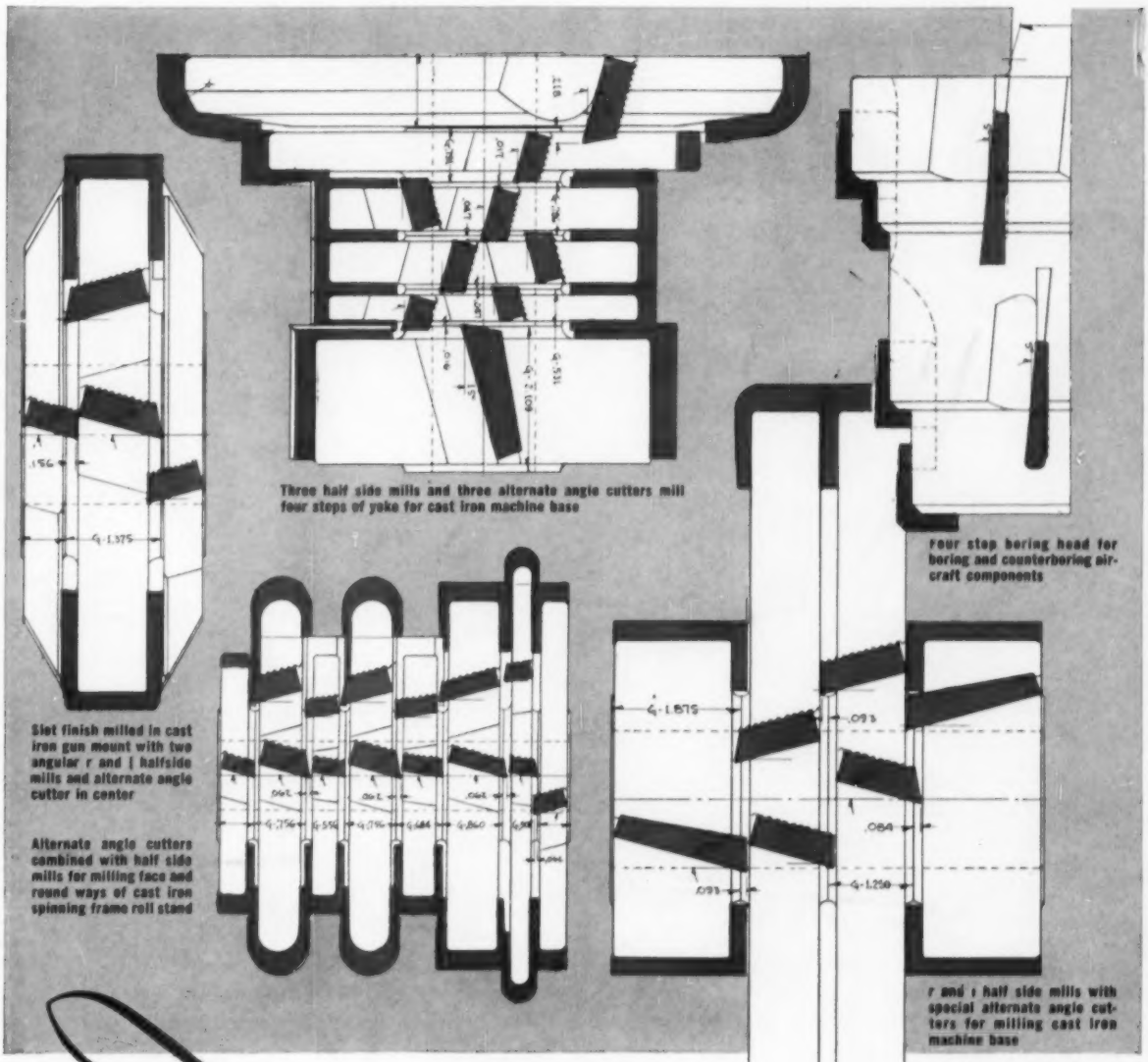
Ask your Allegheny Ludlum representative about this money-saving method of die making . . . or write *Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda and Jarvis Aves., Detroit 20, Mich.*

For complete MODERN Tooling, call

Allegheny Ludlum

AL® FINE TOOL STEELS SINCE 1854

WSW 6079



Three half side mills and three alternate angle cutters mill four steps of yoke for cast iron machine base

Four step boring head for boring and counterboring aircraft components

Slot finish milled in cast iron gun mount with two angular r and ℄ halfside mills and alternate angle cutter in center

Alternate angle cutters combined with half side mills for milling face and round ways of cast iron spinning frame roll stand

r and ℄ half side mills with special alternate angle cutters for milling cast iron machine base

Free - 50p Book

engineering data
tooling specifications
and helpful information

This book of fifty O K Tool prints shows how leading manufacturers in aircraft, automotive, electrical and machinery industries meet rising production costs with *new multidiam boring heads* and *milling cutters* — new tools that do up to eight and ten metal-removing operations with a single stroke of the machine or one pass of the tool.

Special heads bore and face at four levels, chamfer some holes, all in a few minutes. Savings in man hours and machine time can be reduced to one-sixth of the previous cost.

Fresh from the press and now released for the first time, this book is an inspiration to engineers, designers, methods and production men. IT'S FREE!

OK **modern milling cutters for modern milling machines**

O K TOOL COMPANY 400 Elm St. Milford, N. H.

Please send me a copy of OK's new multidiam tool book

name _____

title _____

firm _____

street _____

city _____ state _____

products manufactured _____

_____

employees _____

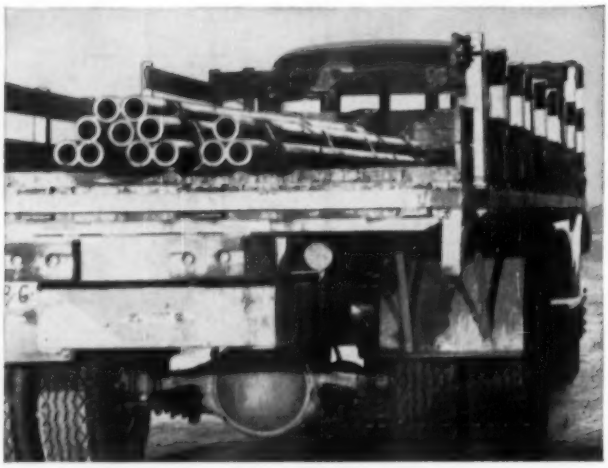
Equipment: how many boring mills _____

milling machines _____ lathes _____

planers _____ shapers _____

Your order of...

TIMKEN® 52100 steel tubing goes from here



...to here within 24 hours!

GOT a rush hollow parts job? Phone, wire or write the Timken Company. We'll ship you less-than-mill quantities of 52100 steel tubing from mill stock within 24 hours after receiving your order. It's the ideal steel for many of your hollow parts jobs.

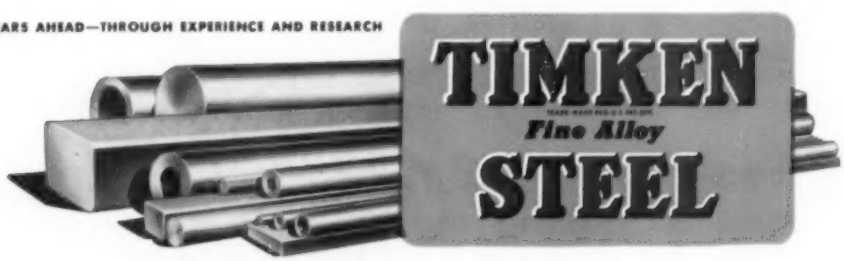
Besides saving you time, Timken® 52100 steel tubing can save you money. It can be substituted for more expensive steels. It's through-hardened in moderate sections and can be heat treated to file hardness and tempered back to any desired point.

Available in sizes from 1″ to 10½″, Timken 52100 steel is especially suited for hollow parts jobs like aircraft parts, ball bearing races, pump parts and plungers, collets, bushings, spindles, grinding machine parts, and precision instruments.

As America's pioneer producer of 52100 steel, the Timken Company has unequalled experience, assuring you of uniform quality from tube to tube and heat to heat. And we're the only company that makes 52100 steel in tubes, bars and wire.

For fast delivery of your less-than-mill quantity orders, pick up your phone right now. Call The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING